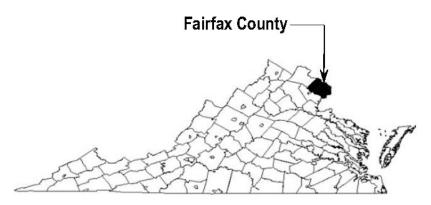


FAIRFAX COUNTY, VIRGINIA AND INCORPORATED AREAS

COMMUNITY NAME

CLIFTON, TOWN OF FAIRFAX COUNTY (UNINCORPORATED AREAS) HERNDON, TOWN OF VIENNA, TOWN OF

COMMUNITY NUMBER



EFFECTIVE DATE: SEPTEMBER 17, 2010



Federal Emergency Management Agency FLOOD INSURANCE STUDY NUMBER 51059CV000A

NOTICE TO FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Selected Flood Insurance Rate Map panels for the community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
В	X
C	X

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

Initial Countywide FIS Effective Date: September 17, 2010

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FLOOD INSURANCE STUDY FAIRFAX COUNTY, VIRGINIA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Fairfax County, Virginia, including the Towns of Clifton, Herndon, and Vienna and the unincorporated areas of Fairfax County and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that the Cities of Fairfax and Falls Church will not be included in this FIS as those cities have previously approved Digital Flood Insurance Rate Maps (DFIRM). Both cities have requested that these previously approved DFIRMs not be included with the countywide analysis.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This countywide FIS has been prepared to include the Towns of Clifton, Herndon, and Vienna and the unincorporated areas of Fairfax County into a countywide FIS. Information on the authority and acknowledgements for each jurisdiction included in this countywide FIS, as compiled from their previously printed individual FIS reports (References 1-4), is shown below:

Town of Clifton The FIS was conducted by CH2M Hill, Inc., at the request of

the Federal Insurance Administration (FIA), U. S. Department of Housing and Urban Development (HUD). Authority and financing are contained in Contract No. H-3833 between the

contractor and the FIA.

Town of Herndon Hydrologic and hydraulic analyses for this study were prepared

by the United States Geological Survey (USGS) for FIA, under Inter-Agency Agreement No. IAA-H-17-75, Project Order

No. 14. This work was completed in June 1977.

Town of Vienna	Hydrologic and hydraulic analyses for this	study were prepared

by the USGS for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. IAA-H-8-76,

Project Order No. 13. This work was completed in

January 1980.

Unincorporated Areas of Fairfax County

Hydrologic and hydraulic analyses for this study were prepared by Bernard Johnson Inc., for FEMA, under Contract No. EMW-85-C-1920. The work was completed in October 1986. Additional hydrologic and hydraulic information was provided by the Fairfax County Storm Drainage Branch. The USACE provided new hydrology and a new hydraulic model for Cameron Run completed in May of 2007. Furthermore, in August 2008, the USACE completed a storm surge study of the tidal portions of the Potomac River which has been included in this study.

For this countywide FIS, the inclusion of new hydrologic and hydraulic analyses of Cameron Run and the storm surge study of the Potomac River (both provided by USACE), in addition to the digital DFIRM database and mapping were prepared for FEMA by Michael Baker Jr., Inc. to the unified Potomac River. This work was completed in May 2009.

1.3 Coordination

The purpose of an Initial Consultation Coordination Officer's (CCO) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the study. The dates of the initial and final CCO meetings held for all the incorporated communities within Fairfax County are shown in Table 1, "Initial and Final CCO Dates", below:

Table 1 - Initial and Final CCO Meeting Dates

Community Name	Initial CCO	Final CCO Meeting Date
	Meeting Date	
Town of Clifton	*	March 5, 1976
Town of Herndon	March 1975	July 24, 1978
Town of Vienna	February 1976	October 21, 1980
Unincorporated Areas	January 23, 1985	December 2, 1987

^{*} Data not available.

The initial CCO meetings were held with representatives from the communities, the study contractors, and FEMA, to explain the nature and purpose of FISs, and to identify the streams to be studied by detailed methods. All affected communities were requested to provide any data pertinent to the study. The final CCO meetings were held with representatives from the communities, the study contractors, and FEMA to review the results of the studies.

For this countywide FIS, a final CCO meeting was held on July 28, 2009 to review the results of this countywide FIS.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the unincorporated areas of Fairfax County, Virginia, as well as the incorporated communities listed in Section 1.1. The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction.

All, or portions of, the flooding sources listed in Table 2, "Detailed Studied Streams", were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the Flood Insurance Rate Map (FIRM).

Table 2 - Detailed Studied Streams

Big Rocky Run Tributary No. 1 Pimmit Run
Cameron Run Popes Head Creek
Dogue Creek Potomac River
Folly Lick Branch
Holmes Run Sugarland Run

Little Hunting Creek
Little Hunting Creek Tributary
No. 1

Tributary 1 to Little Hunting Creek
Tributary 1 to North Fork Dogue Creek
Tributary 2 to North Fork Dogue Creek

Long Branch Four Mile Run Tributary 1 to North Branch

North Branch Tripps Run
North Fork Dogue Creek Wolftrap Creek

Paul Spring Branch

For this countywide FIS, limits of detailed study for the newly studied or revised streams are shown in the following tabulation:

_	
Stream Name	Limit of Detailed Study

Big Rocky Run Tributary No. 1 From approximately 250 feet downstream of Lee-Jackson

Memorial Highway/U.S. Route 50 to 1,250 feet

downstream.

Cameron Run From its confluence with the Potomac River to

approximately 5,600 feet upstream of the confluence of

Pike Branch.

Dogue Creek From its confluence with the Potomac River to

approximately 300 feet upstream of State Route 611.

Folly Lick Branch For its entire length within the Town of Herndon.

Holmes Run From approximately 460 feet downstream of

Lakeview Causeway to approximately 0.21 mile

upstream of State Route 703.

Little Hunting Creek From its confluence with the Potomac River to

approximately 1.17 miles upstream of Janna Lee Ave.

Little Hunting Creek From the confluence with Little Hunting Creek to a point Tributary No. 1 approximately 0.4 mile upstream of the confluence with Little Hunting Creek. Long Branch Four Mile Run From the Fairfax County boundary to approximately 0.23 mile upstream of Olin Drive. North Branch From its confluence with Little Hunting Creek to approximately 0.81mile upstream of the confluence of Paul Spring Branch. From its confluence with Dogue Creek to North Fork Dogue Creek approximately 300 feet upstream of Woodley Drive. Paul Spring Branch From its confluence with North Branch to approximately 800 feet upstream of University Drive. Pimmit Run From approximately 520 feet downstream of State Route 694 to approximately 700 feet upstream of State Route 7. Popes Head Creek For its entire length within the Town of Clifton. Potomac River From the Fairfax County boundary to the confluence of Cameron Run. Spring Branch For its entire length within the Town of Herndon. Sugarland Run For its entire length within the Town of Herndon. Tributary 1 to Little Hunting From its confluence with Little Hunting Creek to Creek approximately 0.18 mile upstream of Camden Street. Tributary 1 to North Fork From its confluence with North Fork Dogue Creek to Dogue Creek approximately 350 feet upstream of Frye Road. From its confluence with North Fork Dogue Creek to Tributary 2 to North Fork Dogue Creek approximately 260 feet upstream of State Route 235. Tributary 1 to North Branch From its confluence with North Branch to approximately 0.81 mile upstream of Stacey Road. Tripps Run From approximately 650 feet downstream of

Wolftrap Creek For its entire length within the Town of Vienna.

Sissler's Bridge.

The following streams were also studied by detailed methods; however, no profiles appear for these streams since they are not part of the scope of this study: Accotink Creek, Bear

Potterton Drive to approximately 325 feet upstream of

Branch, unnamed tributary to Cub Run, Bull Run, Burke Lake, Cain Branch, Captain Hickory Run, Crook Branch, Cub Run, Dead Run, Difficult Run, Elk Horn Run, Flatlick Branch, Gunston Cove, Hatch Lake, Hobbs Branch, Horsepen Run, Hunting Creek, Kanes Creek, Little Difficult Run, Long Branch, Massey Creek, Occoquan Bay, the Occoquan River, Piney Branch, Piney Run, Pohick Bay, Pohick Creek, Sand Branch, Scott Run, Sideburn Branch, South Fork, South Run, Unnamed Tributary No. 1, and Wolftrap Creek. Holmes Run Overflow Channel, a shallow flooding area, was studied by detailed methods. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through October 1991.

This countywide FIS incorporates the determinations of Letter of Map Revisions (LOMRs) issued by FEMA, for the projects listed by community in Table 3, "Letters of Map Revision."

Table 3 - Letters of Map Revision

Community Name	Case Number	Stream(s)/Project Identifier	<u>Date</u>
Fairfax County, Unincorporated Areas	96-03-141P	Reflects revised hydraulic analysis on an unnamed tributary to Big Rocky Run in the vicinity of Cedar Lakes Property and Hanger Road.	October 17, 1996
Fairfax County, Unincorporated Areas	98-03-209P	Reflects more detailed topographic data along the confluence of an unnamed tributary to Hobbs Branch with Hobbs Branch to a point just downstream of State Route 620.	January 4, 1999
Fairfax County, Unincorporated Areas	99-03-1486P	Reflects more detailed topographic data along Holmes Run, in the vicinity of Interstate 495 and Interstate 66 interchange.	November 30, 1999
Fairfax County, Unincorporated Areas	01-03-157P	Reflects more detailed topographic data along an unnamed tributary to Little Rocky Run in the vicinity from a point approximately 800 feet downstream of Leland Road to a point just upstream of Leland Road.	September 7, 2001
Fairfax County, Unincorporated Areas	02-03-165P	Reflects updated hydraulic and hydrologic analyses on Unnamed Tributary No. 1 to Accotink Creek from approximately 900 feet upstream of Interstate 66 to just upstream of Interstate 66.	December 3, 2002

<u>Table 3 - Letters of Map Revision</u> - continued

Community Name	Case Number	Stream(s)/Project Identifier	<u>Date</u>
Fairfax County, Unincorporated Areas	04-03-039P	Reflects more detailed topographic data and updated hydraulic and hydrologic analyses on Little Hunting Creek from a point approximately 0.4 mile upstream of Janna Lee Avenue to a point approximately 1.2 miles upstream of Janna Lee Avenue and on Little Hunting Creek Tributary No. 1 from the confluence with Little Hunting Creek to a point approximately 0.4 mile upstream of the confluence with Little Hunting Creek.	May 26, 2004
Fairfax County, Unincorporated Areas	04-03-149P	Reflects more detailed topographic data and updated hydraulic analyses on Tripps Run from a point approximately 150 feet upstream of Jefferson Avenue to a point approximately 1,050 feet upstream of Jefferson Avenue.	April 4, 2005
Fairfax County, Unincorporated Areas	07-03-1403P	Reflects more detailed topographic data along Big Rocky Run in the vicinity of Fair Lakes Circle, Roger Stover Drive, Market Commons Drive, Eastwick Court, Beacon Grove Circle, Liberty Bridge Road, and Fair Lakes Parkway.	December 27, 2007
Fairfax County, Unincorporated Areas	09-03-0421P	Reflects more detailed topographic data along Big Rocky Run Tributary No. 1 in the vicinity of Tall Timbers Drive.	February 16, 2010

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon, by FEMA and each individual municipality.

2.2 Community Description

Fairfax County is located in northern Virginia and has a total area of 410 square miles. It is

bordered by Prince William County to the southwest; Montgomery County, Maryland, to the northeast; Prince Georges County, Maryland, to the east; Charles County, Maryland, to the southeast; the City of Alexandria and Arlington County to the east; and Loudoun County to the northwest.

Fairfax County has been one of the most rapidly growing counties in Virginia. The population of the county was 984,336 in 2000, an increase of over 100% since the 1970 census. (Reference 5) The estimated population in 2004 was approximately 1,003,157 (Reference 6).

The east and southeastern portion of the county is feeling the pressure of new development due to the population growth. Although Fairfax County is considered a suburb of Washington, D. C., an increasing number of employees are working for businesses that are being established in the county (Reference 8).

The Town of Clifton, the smallest town in Fairfax County, is located approximately 5 miles southwest of the City of Fairfax. The town is only 92 acres and has a population of 185 (Reference 13). The Town of Clifton has tried to maintain its semi-rural nature and development has been discouraged in the past.

The Town of Herndon is located approximately 9 miles northwest of the City of Fairfax and 20 miles northwest of Washington D.C. occupies approximately 4.2 square miles. The northwest town boundary coincides with the Fairfax County – Loudoun County line; the unincorporated community of Reston lies to the southeast. The population of 21,655 in 2000 marked a growth of over 30% throughout the 1990s (Reference 9). Land uses that were once dominated by semi-rural economic activities now reflect suburban type, residential development and associated commercial, industrial, and recreational facilities.

The Town of Vienna is located approximately 4 miles northeast of the City of Fairfax and 4.5 miles west of the City of Falls Church. The 2000 population was reported to be 14,453, a decline of approximately 3% since 1990 and a decline of almost 15% since 1970 (Reference 11 & 12). However, the estimated population in 2003 was reported to be up to 14,868, an increase of 3% (Reference 10).

Fairfax County has a continental, humid, temperate climate. The average annual temperature is 57.5 degrees Fahrenheit (°F) with an average monthly high of 78.9°F in July and an average monthly low of 35.2°F in January (Reference 8).

The average annual rainfall is approximately 40 inches with an average monthly high of over 4 inches in August and an average low of 2.6 inches in February (Reference 12). The 24-hour, 100-year rainfall is approximately 7.3 inches (Reference 14). Rainfall throughout the county usually occurs as showers, thunderstorms, or from hurricanes or extra tropical storms that originate in the central Atlantic Ocean off the coast of Africa or in the Gulf of Mexico. Average snowfall is not significant although storms producing 1 to 2 feet have occurred on rare occasions.

Fairfax County lies in the northern portion of the Piedmont and Coastal Plain physiographic provinces. The fall line occurs between these two provinces. Elevation ranges from sea level along the shoreline of the Potomac River to 580 feet at Tysons Corner. The drainage pattern in the Piedmont province is dendritic with V-shaped valleys and steep slopes that rise

abruptly from the floodplain. The drainage pattern in the lower Coastal Plain is not well developed (Reference 15).

2.3 Principal Flood Problems

Three types of storms cause flooding in the study area: thunderstorms, hurricanes and frontal storms. The summer thunderstorm with high-intensity, short-duration rainfall is the major cause of flooding. Hurricanes create flood conditions by producing excessive amounts of rain. Frontal storms may cause flooding, depending on antecedent conditions.

Rainfall during the period of August 19-25, 1967, associated with a series of cold fronts, produced peak runoff rates in the range of 800 to 1,000 cubic feet per second (cfs) per square mile on basins under 2.0 square miles (Reference 16).

The Town of Clifton has been damaged by floods two times in recent history; these floods occurred in 1969 and 1972, with the most extensive damage occurring as a result of Tropical Storm Agnes in 1972. During high water this area is still subject to flooding by backwater from Popes Head Creek (Reference 1).

In the Town of Herndon, Tropical Storm Agnes produced a peak rate of runoff of 660 (cfs) per square mile on Sugarland Run downstream from the study area (drainage area 13.2 square miles), and 1,150 (cfs) per square mile on Horsepen Run (drainage area 7.2 square miles). These rates of runoff are 84 and 118 percent of the 1-percent-annual-chance discharges for these sites (Reference 2).

Peak runoff at the USGS gaging station on Piney Branch at North Center Street in the Town of Vienna was 965 (cfs) per square mile from a 0.29 square mile drainage area. At the gaging station on Bear Branch, near Vienna, the peak rate of runoff was 814 (cfs) per square mile from a 2.04 square mile drainage area. This was surpassed during the thunderstorm on July 22, 1969, producing a peak flow of 3,500 cfs at the Bear Branch gaging station (Reference 17). This flood, the highest recorded on Bear Branch, is estimated to be 25 percent greater than the 1-percent-annual-chance flood (Reference 18).

Wolftrap Creek is another major source of flooding within the Town of Vienna. The area subject to greatest flood damage is in the vicinity of Maple Avenue, where there is extensive commercial development in the flood plain northeast of the creek. Tropical Storm Agnes produced flood marks on Wolftrap Creek at Beulah Road, indicating that the peak discharge was at least equal to the 25-year recurrence interval flood (Reference 19).

The Potomac River is affected by daily tides from the Chesapeake Bay to Chain Bridge in Washington, D.C. Above Chain Bridge, tidal effects diminish rapidly and riverine characteristics are dominant.

Flooding of the low-lying areas below Chain Bridge along the Potomac River is caused by rainfall runoff on the upper Potomac watershed, unusually high tides caused by either wind setup or storm surge from low pressure systems or hurricanes, flooding of the tributaries to the Potomac River from rainfall runoff, or a combination of two or more of these events. When normal high tide corresponds with any of the events, flooding problems are exacerbated.

Riverine flooding of the interior streams not affected by the Potomac River has caused damage to low-lying buildings adjacent to these streams. Major flooding occurred in March 1936, June 1972 (with Tropical Storm Agnes), November 1985, and in January and September 1996. (Reference 20)

The most recent widespread flooding in the Cameron Run watershed occurred in June 2006. Several roadways, including Telegraph Road and U.S. Route 495/95 (Capital Beltway) were overtopped; commercial and residential structures in the City of Alexandria reported significant flooding; stormwater infrastructure was inundated with larger than design flows causing deep ponding of water on roadways; and the Huntington area in Fairfax County, on the southern bank of Cameron Run, received significant flood damages. News reports estimated damages in Huntington near \$10 million (Reference 40).

2.4 Flood Protection Measures

There are no existing flood control structures that affect flooding in the Towns of Clifton, Herndon, or Vienna. Each town has adopted the Virginia Uniform Statewide Building Code of September 1973. (Reference 21)

The building inspector for the Town of Clifton currently uses high water marks from the Agnes (1972) flood to estimate the 1-percent-annual-chance flood plain. The Towns of Herndon and Vienna use 1-percent-annual-chance flood elevations and flood boundaries developed in a study prepared by the USGS in cooperation with the County of Fairfax, to regulate development in the flood plain (Reference 22). For any proposed development in areas not included in the aforementioned study, the developer is required to define a 1-percent-annual-chance flood plain as part of a storm water management plan for the site. No structural flood protection measures, such as levees or dams, are planned.

Fairfax County Floodplain Management ordinance currently requires new development to set first floor elevations 18 inches above the 1-percent-annual-chance flood level and provide a minimum distance of 15 feet between the 1-percent-annual-chance floodplain boundary and the building (Reference 22).

For the streams in the unincorporated areas, Holmes Run Dam is the only existing significant flood protection structure.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood-hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein

reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

Pre-countywide Analyses

Discharges for Popes Head Creek for the 10-, 2-, and 1-percent-annual-chance recurrence intervals were computed using regional rainfall-runoff relationships published by the USG S (Reference 23). These computations included consideration of the percentage of watershed development as determined by recent aerial photographs (1974) and by field reconnaissance. The discharge for the 0.2-percent-annual-chance flood was determined by straight-line extrapolation of the semi log graph of flood discharges computed for frequencies up to the 1-percent-annual-chance event.

For the Towns of Herndon and Vienna, discharges for the 10-, 2-, and 1-percent-annual-chance recurrence intervals were computed using peak discharge-frequency relationships developed by the USGS that consider the effect of urban and suburban development on flood flows (Reference 23). These relationships use drainage basin size, channel length and slope, the percentage of impervious surface and type of drainage system in order to adjust flood peaks for the effects of development. Discharges for the 0.2-percent-annual-chance flood were determined by extrapolation of the data presented in the USGS report. Discharges developed in a previously published report were used in this study (Reference 19).

The flow of Wolftrap Creek at the Maple Avenue culvert divides between the main channel and the flood plain to the north. For discharges greater than the 10-percent-annual-chance recurrence interval part of the flow bypasses the tail water section of the culvert. Tail water elevations at the culvert were computed using discharges reduced by the amount of bypass flow for each recurrence interval flood. The bypass flow returns to the main channel between buildings along the west side of Maple Avenue. All flow returns to the creek approximately 0.37 mile upstream of the Town of Vienna corporate limits.

Discharges for the 10-, 2-, and 1-percent-annual-chance floods on Pimmit Run and Long Branch of Four Mile Run were determined by the Anderson Method as described in the Fairfax County Public Facilities Manual and the USGS publication "Effects of Urban Development on Flood in Northern Virginia" (References 22 and 23). The Anderson Method uses a regional regression equation based on percent imperviousness of the water shed, drainage area size, ratio to average storm, and lag time. The discharge for the 0.2-percent-annual-chance storm was extrapolated using log-probability paper.

Discharges on Little Hunting Creek, Tributary 1 to Little Hunting Creek, North Branch, Tributary 1 to North Branch, Paul Spring Branch, Dogue Creek, North Fork Dogue Creek, Tributary 1 to North Fork Dogue Creek, Tributary 2 to North Fork Dogue Creek, Tripps Run, and Holmes Run were obtained from the hydrologic computer model MITCAT provided by the County of Fairfax Storm Drainage Branch (Reference 24). This model divides the watershed into subareas and assigns generalized characteristics such as percent imperviousness and type of channel or pipe outlet for each subarea. Hydrographs are

calculated at specified points and routed downstream. The effects of impoundment storage and channel diversion are accounted for. The MITCAT models were developed assuming that the subareas are fully developed according to county zoning and planning maps. At the time of the analysis, there was little or no land available for new development in these watersheds. Therefore, the assumption of a fully developed watershed does not differ significantly from development conditions at the time the analysis was performed.

Generally, the 1-, 6-, and 12-hour storms each for the 10-, 4-, and 1-percent-annual-chance storms were available from the MITCAT models, respectively. The discharge from the duration storm (i.e. 1-, 6-, or 12-hour) resulting in the highest peak discharge for a given return interval was used as the controlling discharge for that return interval storm. The controlling discharge for the 10-, 4-, and 1-percent-annual-chance storms were then plotted on log-probability paper. Drawing a straight line through these points, the 2- and 0.2-percent-annual-chance discharges were determined.

A split flow occurs on Holmes Run from State Route 703 to approximately 800 feet upstream. The discharges used in the main channel and the overflow were computed by the split flow option in the U. S. Army Corp of Engineers (USACE) HEC-2 computer program (Reference 25).

For a portion of the Potomac River, the approximate elevations were determined using Virginia Institute of Marine Science (VIMS) elevations at Cornfield Harbor (mouth of the Potomac River) and National Oceanic and Atmospheric Administration (NOAA) gage records at Washington, D. C., to develop peak elevation-frequency relationships (References 26 and 27). Gage data at Washington, D. C., and elevations determined by VIMS at Cornfield Harbor were input into a USACE formula to establish elevations at Dahlgren (Reference 28). The formula is:

Surge at the mouth of the Potomac River = surge at Dahlgren - one half (surge at Washington, D. C. - surge at Dahlgren). Using these data, peak elevation curves were prepared for the 10-, 2-, 1-, and 0.2-percent-annual-chance events from Washington, D. C., to the Chesapeake Bay.

Peak discharge-drainage area relationships for all streams within Fairfax County that have been studied in detail are shown in Table 4, "Summary of Discharges"

Countywide Analyses

The Cameron Run watershed was restudied by the USACE, and portions of this study have been incorporated into this Countywide FIS. To determine the existing peak flows for the 10-, 4-, 2-, 1-, and 0.2-percent-annual-chance flood events, the U.S. Army Corps of Engineers Hydrologic Modeling System (HMS), version 3.1.0, was used. HEC-HMS is designed to simulate the precipitation-runoff process in dendritic watershed systems. It is designed to be applicable in a wide range of geographic areas for solving the widest possible range of problems, and is an FEMA approved model (Reference 42).

Although the watershed contains a streamflow gage operated by the USGS, with 50+ years of record, the project scope specifically outlined the use of a rainfall-runoff model, such as HEC-HMS, to perform the analysis. This is due to the theory that the data record at the USGS gage is not homogeneous due to increasing levels of watershed development throughout the period of record. USACE Engineering Regulation 1110-2-1464 states that a

Table 4, "Summary of Discharges"

		Peak Discharges (cubic feet per second)			
Flooding Source and Location	Drainage Area	10-Percent-	2-Percent-	1-Percent-	0.2-Percent-
	(Square Miles)	Annual-Chance	Annual-Chance	Annual-Chance	Annual-Chance
BIG ROCKY RUN TRIBUTARY NO. 1	,				
Approximately 1,000 feet downstream of Lee-Jackson Memorial					
Highway/U.S. Route 50	0.57	+	†	1,875	+
CAMERON RUN					
Upstream of Richmond Highway (and ramps)	44.49	11,203	20,400	25,414	39,189
At Telegraph Road (Huntington Area)	39.14	10,820	20,400	25,398	39,056
DOGUE CREEK					
At Mount Vernon Road	15.27	4,740	7,100	8,333	11,500
Just upstream of confluence of North Fork Dogue Creek	10.78	2,636	3,740	4,213	5,300
At U.S. Route 1	10.57	2,675	3,750	4,250	5,350
At State Route 622	9.71	2,596	3,660	4,030	5,200
Approximately 0.61 mile upstream of State Route 622	6.90	1,864	2,510	2,909	3,650
Just upstream of confluence of Barnyard Run	2.82	1,077	1,670	2,121	2,750
Just downstream of State Route 611	1.89	978	1,470	2,090	2,800
Just upstream of State Route 611	1.89	1,575	2,280	2,673	3,450
FOLLY LICK BRANCH					
At confluence with Sugarland Run	2.83	1,900	3,100	3,700	5,200
At downstream corporate limit	2.05	1,800	2,900	3,400	4,700
At confluence with Spring Branch	0.86	750	1,240	1,510	2,040
At abandoned railroad	0.57	500	820	1,000	1,350
HOMES RUN					
At State Route 613	7.07	3,185	4,600	5,542	6,600
Approximately 700 feet upstream of Rose Lane	5.54	2,148	3,000	3,578	4,250
At State Route 649	4.68	1,673	2,400	2,825	3,500
Downstream of Homes Run Dam	2.62	461	750	903	1,180
Downstream of U.S. Routes 29 and 211	1.19	1,158	1,650	1,773	2,300
Upstream of U.S. Routes 29 and 211	1.19	1,348	2,000	2,460	3,000
At State Route 703	(1)	924	1,046	1,116	1,191
Approximately 800 feet upstream of State Route 703	(1)	1,348	2,000	2,460	3,000
LITTLE HUNTING CREEK					
Upstream of George Washington Memorial Parkway	9.65	7,004	9,885	12,725	17,000
Just downstream of confluence of North Branch	7.76	6,357	8,957	11,364	14,000
Just upstream of confluence of North Branch	2.78	2,606	3,753	4,786	6,000
Upstream of U.S. Route 1	2.14	2,685	3,677	4,605	5,750
Approximately 0.64 mile downstream of Fordson Road	1.21	2,418	3,323	4,240	5,150
Approximately 0.33 mile downstream of Fordson Road	1.03	2,101	2,876	2,659	4,200

Table 4, "Summary of Discharges"

		Peak Discharges (cubic feet per second)			
Flooding Source and Location	Drainage Area	10-Percent-	2-Percent-	1-Percent-	0.2-Percent-
8	(Square Miles)	Annual-Chance	Annual-Chance	Annual-Chance	Annual-Chance
LITTLE HUNTING CREEK TRIBUTARY NO. 1					
At confluence with Little Hunting Creek	1.22	+	†	1,672	†
LONG BRANCH FOURMILE RUN				-,-,-	
At county boundary	1.00	1,220	1,937	2,295	3,600
Approximately 1,000 feet upstream of Fairfax County boundary	0.86	1,116	1,722	2,041	3,210
Approximately 0.49 mile upstream of Fairfax County boundary	0.67	885	1,365	1,618	2,500
Approximately 1,000 feet upstream of State Route 714	0.41	580	922	1,092	1,750
NORTH BRANCH	02	200	722	1,002	1,700
At confluence with Little Hunting Creek	4.98	4,039	5,551	6,925	8,700
At State Route 628	2.64	2,539	3,503	4,431	5,520
NORTH FORK DOGUE CREEK		_,	2,2 22	.,	2,023
At confluence with Dogue Creek	4.17	3,176	4,600		
Just upstream of confluence of Tributary 1 to North Fork Dogue Creek	2.12	1,774	2,700	3,129	4,300
Just downstream of Union Farm Road	1.68	1,826	2,580	2,986	2,810
Just downstream of State Route 624	1.08	1,202	1,810	2,208	3,000
Just upstream of State Route 624	0.89	963	1,580	1,904	2,800
Approximately 0.32 mile upstream of State Route 624	0.68	625*	1,024*	1,261*	1,805*
At Woodley Drive	0.46	286	468	618	810
PAUL SPRING BRANCH					
At confluence with North Branch	1.93	2,154	2,960	3,687	4,550
Upstream of Mason Hill Drive	1.27	1,726	2,382	2,948	3,850
Upstream of Paul Spring Road	1.13	1,636	22,668	2,820	3,460
Upstream of University Drive	0.41	894	1,217	1,563	1,950
PIMMIT RUN					
Approximately 500 feet downstream of State Route 694	2.92	2,805	4,455	5,115	7,000
Approximately 600 feet upstream of Dulles Access Road	2.42	1,541	2,447	2,810	3,950
At State Route 7	0.64	1,013	1,609	1,847	2,500
POPES HEAD CREEK	18*	2,400*	4,600*	5,900*	10,000*
SPRING BRANCH					
At confluence with Folly Lick Branch	0.65	570	930	1,140	1,540
At Park Avenue	0.43	380	620	750	1,020
At Willow Street	0.39	340	560	680	930
SUGARLAND RUN					
At confluence with Folly Lick Branch	6.70	3,700	5,500	6,400	8,600
At downstream corporate limit	5.07	3,100	4,800	5,500	7,400
At Spring Street	2.22	2,100	3,100	3,500	4,600
At upstream corporate limits	1.08	1,200	1,800	2,100	2,700

Table 4, "Summary of Discharges"

		Peak Discharges (cubic feet per second)			
Flooding Source and Location	Drainage Area	10-Percent-	2-Percent-	1-Percent-	0.2-Percent-
	(Square Miles)	Annual-Chance	Annual-Chance	Annual-Chance	Annual-Chance
TRIBUTARY 1 TO LITTLE HUNTING CREEK					
Upstream of Camden Street	0.57	737	975	1,232	1,540
Approximately 350 feet upstream of Camden Street	0.34	334	445	574	700
TRIBUTARY 1 TO NORTH FORK DOGUE CREEK					
At confluence with North Fork Dogue Creek	1.88	1,574	2,290	2,728	3,500
Just upstream of U.S. Route 1	1.70	1,684	2,480	2,937	3,880
Just downstream of State Route 622	0.81	883	1,310	1,578	2,050
Just downstream of Keeler Street	0.60	700	1,000	1,236	1,580
TRIBUTARY 2 TO NORTH FORK DOGUE CREEK					
At confluence with North Fork Dogue Creek	0.45	799	1,130	1,329	1,720
TRIBUTARY 1 TO NORTH BRANCH					
At confluence with North Branch	1.37	2,033	2,867	3,540	4,200
TRIPPS RUN					
Approximately 450 feet downstream of Potterton Drive	5.01	3,746	5,309	6,583	8,400
Upstream of State Route 613	4.49	3,777	5,410	6,740	8,400
Upstream of Holloway Road	3.46	3,301	4,694	5,663	7,200
At U.S. Route 50	2.86	2,814	4,102	5,048	6,700
Upstream of Jefferson Avenue	2.61	3,145	4,447	5,398	7,000
WOLFTRAP CREEK					
At downstream corporate limits	2.85	1,700	2,900	3,400	5,100
At upstream corporate limits	0.90	1,000	1,700	2,000	2,900

^{* =} Data approximated from log graph

** = Interpolated by drainage area

† = Data not available

(1) Drainage area not computed, discharges calculated by the split flow option in USACE HEC-2 computer program.

rainfall-runoff model is desirable where urbanization has changed the runoff response during the gaging record. FEMA guidelines and specifications state that rainfall-runoff models should be used in lieu of a gage analysis where the data is non-homogeneous.

NOAA NWS 6-HOUR precipitation data was used to determine precipitation amounts. The storm area was entered as 46.09 square miles, which is the drainage area of the watershed at the outlet. The peak intensity time was set at 5 minutes. A 33% center of peak at was used for the meteorological model to match historical and statistical data. The actual duration was set at 10 hours to allow ample time for the watershed to respond to the 6-hour storm (Reference 41).

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the

Floodway Data Tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Pre-Countywide Analyses

Cross Sections

Cross sections for backwater analysis for Popes Head Creek were obtained from the USGS. The cross sections were field surveyed for a previous flood plain study that was completed in January 1974 (Reference 29). Bridge geometry and channel cross sections at the bridges were measured in the field. The locations of the selected cross sections may be found on the FIRM.

Flood plain cross section data within the Town of Herndon were developed using topographic maps at a scale of 1"=200' with a contour interval of 2 feet furnished by the Town of Herndon (Reference 30). The main channel sub-sections obtained by field measurement. Survey data for Folly Lick Branch and Spring Branch were obtained using a base line survey technique. Cross section data for Sugarland Run through the town and Folly Lick Branch downstream from Young Avenue were taken from a previous flood plain study completed in 1972 (Reference 31). The dimensions of bridges and culverts and the channel cross sections near these structures were obtained by field measurement.

Cross sections for the backwater analysis of Wolftrap Creek were obtained by field measurement and supplemented by a topographic map at a scale of 1: 1,200 with a contour interval of 2 feet (Reference 32).

Most cross section data for the backwater analysis were taken from a previous USGS flood plain study completed in 1976 (Reference 19). That data were obtained by field measurement

and supplemented by the topographic map referenced above. New cross section data was obtained at culverts built since the 1971 flood plain study was completed. All culvert geometry and below-water sections were obtained by field measurement.

Between East Street and Maple Avenue, survey data was supplemented by site plans (References 32 and 33). Cross sections for Pimmit Run, Little Hunting Creek, Tributary 1 to Little Hunting Creek, North Branch, Tributary 1 to North Branch, Spring Branch, Dogue Creek, North Fork Dogue Creek, Tributary 1 to North Fork Dogue Creek, Tributary 2 to North Fork Dogue Creek, and the Potomac River were determined using aerial photography of the stream valleys (Reference 34). A field survey was used to obtain the channel cross sections at the same locations as the stream sections. The stream section and channel cross sections were then combined to provide a complete cross section spanning the entire floodplain. All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Cross-section data and bridge, dam, and culvert data for Long Branch of Four Mile Run, Tripps Run, Holmes Run, and Holmes Run Overflow Channel were obtained from Fairfax County. A subcritical HEC-2 model was developed from these data.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and on the FIRM.

Water Surface Elevations

Using the discharges obtained in the hydrologic analyses, water surface profiles were determined for the 10-, 2-, 1-, and 0.2-percent-annual-chance recurrence intervals. Water-surface elevations in the Town of Clifton and the unincorporated areas of Fairfax County were computed using the USACE HEC-2 step-backwater computer program (Reference 35).

For the Towns of Herndon and Vienna, water-surface elevations of floods of the selected recurrence intervals were computed through use of the USGS E431 step-backwater computer program (Reference 36).

The water-surface elevations for Cameron Run were computed using the USACE Hydraulic Engineering Center River Analysis System, version 3.1.1 (HEC-RAS). Backwater elevations shown on the profile for Cameron Run are from a statistical analysis of Potomac River storm surge flooding completed by Fairfax County in February 2006 (Reference 40).

Starting Water Surface Elevations

Starting elevations for water surface profiles for Popes Head Creek were estimated based on a previous study by the USGS (Reference 29).

Starting water-surface elevations for Sugarland Run and Folly Lick Branch were taken from previously determined elevations at the Town of Herndon corporate limits. Starting water-surface elevations for Spring Branch were determined from coincident flooding conditions at its confluence with Folly Lick Branch.

Starting water-surface elevations for the 50-and 100-year floods in the Town of Vienna were determined by a step-backwater analysis in a reach of the channel extending 2,700 feet

downstream of the Town of Vienna corporate limits (Reference 37).

Starting water-surface elevations for Pimmit Run and Holmes Run were determined by the slope/area method. Starting water-surface elevations for Little Hunting Creek and Dogue Creek were assumed as spring high tide (3 feet) (Reference 38). Starting water-surface elevations for Tributary 1 to Little Hunting Creek, North Branch, Tributary 1 to North Branch, Paul Spring Branch, North Fork Dogue Creek, Tributary 1 to North Fork Dogue Creek, and Tributary 2 to North Fork Dogue Creek were determined by either the slope/area method or the corresponding elevation on the main stream if coincident peak flooding was probable. Starting water-surface elevations for Long Branch of Four Mile Run are controlled by the culvert at Carlin Springs Road in Arlington County. Starting water surface elevations were assumed to be critical depth for Tripps Run.

The downstream boundary condition used for Cameron Run was normal depth.

Roughness Factors

In the Town of Clifton, channel roughness coefficients (Manning's "n" values) for the hydraulic computations were assigned on the basis of the previous study by the USGS.

For the Town of Herndon, channel roughness factors were estimated by field inspection of the channel segments between cross sections. Average values were estimated for the main channel based on bed material, channel alignment, and overhanging vegetative growth. Values in the flood plains were estimated on the basis of type and density of vegetation. Cross sections were subdivided horizontally to account for these variations, and values assigned to the sub-sections were varied with hydraulic depth.

For the Town of Vienna, channel roughness factors were estimated by field inspection of the channel segments between cross sections. Average values were estimated for the main channel based on bed material, channel alignment, and overhanging vegetative growth. Values in the flood plains were estimated on the basis of type and density of vegetation. In developed flood plains values of 0.020 were used for asphalt parking lots. Cross sections were subdivided horizontally to account for these variations, and values assigned to the subsections were varied with hydraulic depth.

Roughness factors used in the hydraulic computations of the channels located in the unincorporated areas of Fairfax County were chosen by engineering judgment and based on field observations of the streams and floodplain areas and from information in Open Channel Flow (Reference 39).

The channel and over bank "n" values for the Towns of Clifton, Herndon and Vienna along with the Fairfax County Unincorporated areas are listed below in Table 5.

The hydraulic analyses for this study are based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail. However, the blockage of bridge or culvert waterway openings during a period of storm water runoff could result in the flooding of areas outside those within the flood delineation lines.

Table 5 - Manning's 'n' Values

Stream Name Channel Over banks Cameron Run 0.025 to 0.058 0.015 to 0.120 Dogue Creek 0.040 to 0.050 0.050 to 0.090 Folly Lick Branch 0.050 to 0.080 0.030 to 0.220
Dogue Creek 0.040 to 0.050 0.050 to 0.090 Folly Lick Branch 0.050 to 0.080 0.030 to 0.220
Folly Lick Branch 0.050 to 0.080 0.030 to 0.220
TT 1 D 0.000 0.000 0.000 0.110
Holmes Run 0.020 to 0.060 0.020 to 0.110
Little Hunting Creek (natural) 0.035 to 0.040 0.050 to 0.090
Little Hunting Creek (concrete lined) 0.018 0.050 to 0.090
Long Branch Four Mile Run (natural) 0.030 to 0.050 0.030 to 0.100
Long Branch Four Mile Run
(concrete lined) 0.015 to 0.018 0.030 to 0.100
North Branch 0.040 0.050 to 0.090
North Fork Dogue Creek 0.040 0.060 to 0.090
Paul Spring Branch 0.040 0.090
Pimmit Run (natural) 0.040 0.050 to 0.100
Pimmit Run (concrete lined) 0.018 0.050 to 0.100
Popes Head Creek 0.055 to 0.065 0.045 to 0.120
Spring Branch 0.040 to 0.060 0.030 to 0.220
Sugarland Run 0.040 to 0.080 0.065 to 0.220
Tributary 1 to Little Hunting Creek 0.040 0.070 to 0.090
Tributary 1 to North Fork Dogue 0.030 to 0.040 0.050 to 0.080
Creek
Tributary 2 to North Fork Dogue 0.050 0.050 to 0.100
Creek
Tributary 1 to North Branch 0.040 0.080
Tripps Run (natural) 0.032 to 0.050 0.030 to 0.110
Tripps Run (concrete lined) 0.013 to 0.016 0.030 to 0.110
Wolftrap Creek 0.028 to 0.085 0.020 to 0.250

Flood boundaries along streams studied by approximate methods have been approximated using regional flood depth-frequency relations and data developed in the detailed portion of the study. Approximate flood limits were then interpolated between each location.

Countywide Analyses

For Cameron Run

For Cameron Run from its confluence with the Potomac River to just upstream of the Capital Beltway, cross-sections were taken from a HEC-RAS model developed for the Cameron Run Hydrologic and Hydraulic Study completed by VDOT (Reference 41). The HEC-RAS model for this project included a total of 106 cross-sections based on a field survey completed between 1999 and 2001. The cross-sections from this study were modified in the overbank areas by USACE in 2007 to incorporate 1-ft. contour topographic mapping provided by Fairfax County. The VDOT HEC-RAS model includes road crossing data for the George Washington Memorial Parkway, U.S. Route 1 and ramps, Telegraph Road, and the Capital Beltway. At the time of the development of the 2007 USACE FEMA CAMERON RUN HEC-RAS model, construction of the U.S. Route 1 interchange (and ramps) was near completion. Therefore, the model reflects a completed U.S. Route 1

interchange. Telegraph Road and the Capital Beltway are slated to undergo improvements in the near future; however, these improvements are not reflected in this study (Reference 42).

For Potomac River

At the request of Region III of the Federal Emergency Management Agency (FEMA), the US Army Corps of Engineers, Engineer Research and Development Center (ERDC) Coastal and Hydraulics Laboratory (CHL) performed a cursory-level frequency-of-occurrence analysis of storm surge for the tidally-influenced reach of the Potomac River. This reach extends from its confluence with the Chesapeake Bay to the 14th Street Bridge in Washington, DC. The USACE cursory-level analysis was envisioned to be an interim product until a more detailed study is completed (Reference 43).

Michael Baker Jr., Inc. was tasked by FEMA Region III with the development of a unified profile using the USACE Cursory study. Baker investigated the currently effective FIS reports and profiles for comparison purposes and developed new profiles in digital format which have been included in this revision (Reference 44).

Profiles for Fairfax County were updated using station and elevation data derived from the unified Potomac River profiles created using this methodology (Reference 43). Only the 1-percent-annual chance flood profile was updated, where applicable.

Qualifying bench marks within a given jurisdiction are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS). First or Second Order Vertical bench marks that have a vertical stability classification of A, B, or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

Bench marks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)

Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutments)

Stability C: Monuments which may be affected by surface ground movements (e.g., concrete mounted below frost line)

Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

In addition to NSRS bench marks, the FIRM may also show vertical control monument established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for bench marks shown on the FIRM for this jurisdiction, please contact the Information Services Branch

of the NGS at (301) 713-3242, or visit their Web site, www.ngs.noaa.gov.

It is important to note that temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purposes of establishing local vertical control. Although these monuments are not shown on the digital FIRM, they may be found in the Technical Support Data Notebook associated with this FIS and FIRM. Interested individuals may contact FEMA to access this data.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the completion of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are now prepared using NAVD88 as the referenced vertical datum. However, flood elevations shown in this FIS report and on the FIRM for Fairfax County, Virginia and Incorporated Areas will continue to use the NGVD29 datum. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum.

For information regarding the NGVD29 and NAVD88 datum, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services NOAA, N/NGS12 National Geodetic Survey SSMC-3, #9202 1315 East-West Highway Silver Spring, Maryland 20910-3282 (301)-713-3242

To obtain current elevation, description and/or location information for benchmarks shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes.

The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, except Cameron Run, the 1-and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Only the 1-percent-annual-chance floodplain boundaries have been delineated for Cameron Run. Between cross sections, the boundaries were interpolated using topographic maps at various scales and contour intervals. The floodplain delineation for Cameron Run was delineated with the aid of the USACE HECGeoRAS program.

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data. For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM.

For this revision, the floodplain boundaries throughout Fairfax County have been revised based on newer, more up-to-date topographic information than was previously available. The flood elevations, where available were used in conjunction with the updated topographic information to remap the floodplain boundaries. In areas where flood elevations were not available, the existing floodplain boundaries were digitized using the effective FIRMs.

4.2 Floodways

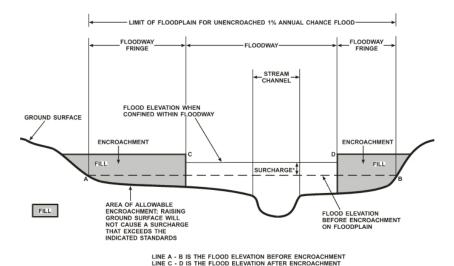
Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for Popes Head Creek in the Town of Clifton and Wolftrap Creek in the Town of Vienna on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (see Table 8, Floodway Data). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

Town of Herndon requires that the entire 100-year flood plain be kept free of encroachment that would increase flood heights. The same requirement prevails in areas adjacent to the town (Fairfax County unincorporated areas). Thus, a floodway is not presented in this study for either community.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

There is no floodway for Cameron Run.



*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER HEIGHT IF SPECIFIED BY STATE OR COMMUNITY.

Figure 1 - Floodway Schematic

FLOODING		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION DISTANCE ¹		WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Popes Head Creek							
A	120	110	1,006	5.8	180.9	179.9	1.0
В	350	255	2,131	2.7	183.2	182.5	0.7
c	650	248	1,599	3.6	183.3	182.6	0.7
D .	970	270	2,109	2.8	183.6	182.9	0.7
E	1,290	108	843	6.9	183.6	182.9	0.7
F	1,690	210	1,516	3.8	185.3	184.3	1.0
G	1,830	359	2,998	1.9	187.0	186.0	1.0
H-	2,010	367	2,990	1.9	187.1	186.1	1.0
I	2,335	231	1,943	3.0	187.2	186.2	1.0
J	2,695	228	1,474	3.9	187.6	186.6	1.0
K	2,995	212	1,158	5.0	88.6	187.6	1.0
L	3,495	227	1,635	3.6	90.3	189.3	1.0
		,		*			
					9		
		1	1				1

1STREAM DISTANCE IN FEET ABOVE THE CORPORATE LIMITS

LE 6	AND INCORPORATED AREAS	POPES HEAD CREEK
TABL	FAIRFAX COUNTY, VA	FLOODWAY DATA

FLOODING SOURCE			FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE 1	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)	
Wolftrap Creek									
A	138	2302	1,118	3.0	358.3	358.3	358.3	0.0	
В	400	200	862	2.8	358.5	358.5	358.6	0.1	
C	701	200	586	4.1	358.7	358.7	358.9	0.2	
D	1,009	200	467	5.1	359.6	359.6	360.0	0.4	
E	1,279	125	533	4.5	361.6	361.6	361.8	0.2	
F	1,556	125	654	3.7	363.4	363.4	363.6	0.2	
G	1,673	125	535	4.5	363.9	363.9	364.0	0.1	
н	1,804	153	564	4.2	365.9	365.9	365.9	0.0	
I	1,915	100	373	6.4	366.0	366.0	366.0	0.0	
J	2,042	96	379	6.3	366.2	366.2	366.2	0.0	
K	2,248	55	294	8.2	366.4	366.4	366.5	0.1	
L	2,800	170	394	6.1	368.8	368.8	368.9	0.1	
M	2,873	100	416	5.8	368.8	368.8	368.9	0.1	
N	2,975	100	336	7.1	368.8	368.8	369.0	0.2	
0	3,116	50	265	9.1	369.2	369.2	369.4	0.2	
P	3,160	50	250	9.6	369.4	369.4	369.6	0.2	
Q	3,370	50	216	11.1	370.8	370.8	370.8	0.0	
R	3,573	75	415	5.8	372.2	372.2	373.2	1.0	
S	3,818	100	612	3.9	373.0	373.0	374.0	1.0	

¹Feet above corporate limits

FEDERAL EMERGENCY MANAGEMENT AGENCY
FAIRFAX COUNTY, VA
AND INCORPORATED AREAS
WOLFTRAP CREEK

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²This width extends beyond corporate limits

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE 1	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREAS (FEET)
Wolftrap Creek					1 1			
(continued)								
T	4,275	100	528	4.5	373.6	373.6	374.6	1.0
U	4,734	140	429	5.6	374.8	374.8	375.3	0.5
v	4,845	138	426	5.6	376.2	376.2	376.4	0.2
W	5,229	111	398	6.0	377.5	377.5	377.6	0.1
x	5,502	118	288	8.3	379.5	379.5	379.5	0.0
Y	5,590	53	197	12.2	380.6	380.6	380.6	0.0
z	5,863	200	921	2.6	385.2	385.2	385.7	0.5
AA	6,150	200	958	2.5	386.5	386.5	387.5	1.0
AB	6,476	200	912	2.6	388.2	388.2	388.9	0.7
AC	6,812	200	825	2.9	390.3	390.3	390.7	0.4
AD	7,100	225	710	3.4	391.7	391.7	392.2	0.5
AE	7,200	298	1,182	2.0	394.8	394.8	394.8	0.0
AF	7,422	150	707	3.4	395.8	395.8	395.9	0.1
AG	7,672	100	577	3.5	397.1	397.1	397.8	0.7
AH	7,825	100	550	3.6	398.0	398.0	398.8	0.8
AI	8,225	1502	689	2.9	400.1	400.1	400.8	0.7
AJ	8,475	2002	809	2.5	401.7	401.7	402.4	0.7

¹Feet above corporate limits

TAB	FAIRFAX COUNTY, VA	FLOODWAY DATA
FE 6	AND INCORPORATED AREAS	WOLFTRAP CREEK

²This width extends beyond corporate limits

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (1-percent-annual-chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile (sq. mi.), and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide FIRM presents flooding information for the entire geographic area of Fairfax County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 7, "Community Map History".

7.0 OTHER STUDIES

This FIS report supersedes all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATES	FIRM EFFECTIVE DATES	FIRM REVISIONS DATES
Clifton, Town of	March 28, 1975	None	May 2, 1977	September 17, 2010
Fairfax County Unincorporated Areas	May 5, 1970	None	January 8, 1972	July 1, 1974 May 7, 1976 May 14, 1976 March 5, 1990 September 17, 2010
Herndon, Town of	June 14, 1974	April 9, 1976	August 1, 1979	September 17, 2010
Vienna, Town of	August 2, 1974	October 24, 1975	February 3, 1982	September 17, 2010
	RGENCY MANAGEMENT AGE FAX COUNTY, VA ICORPORATED AREAS)	NCY	COMMUNIT	Y MAP HISTORY

8.0 LOCATION OF DATA

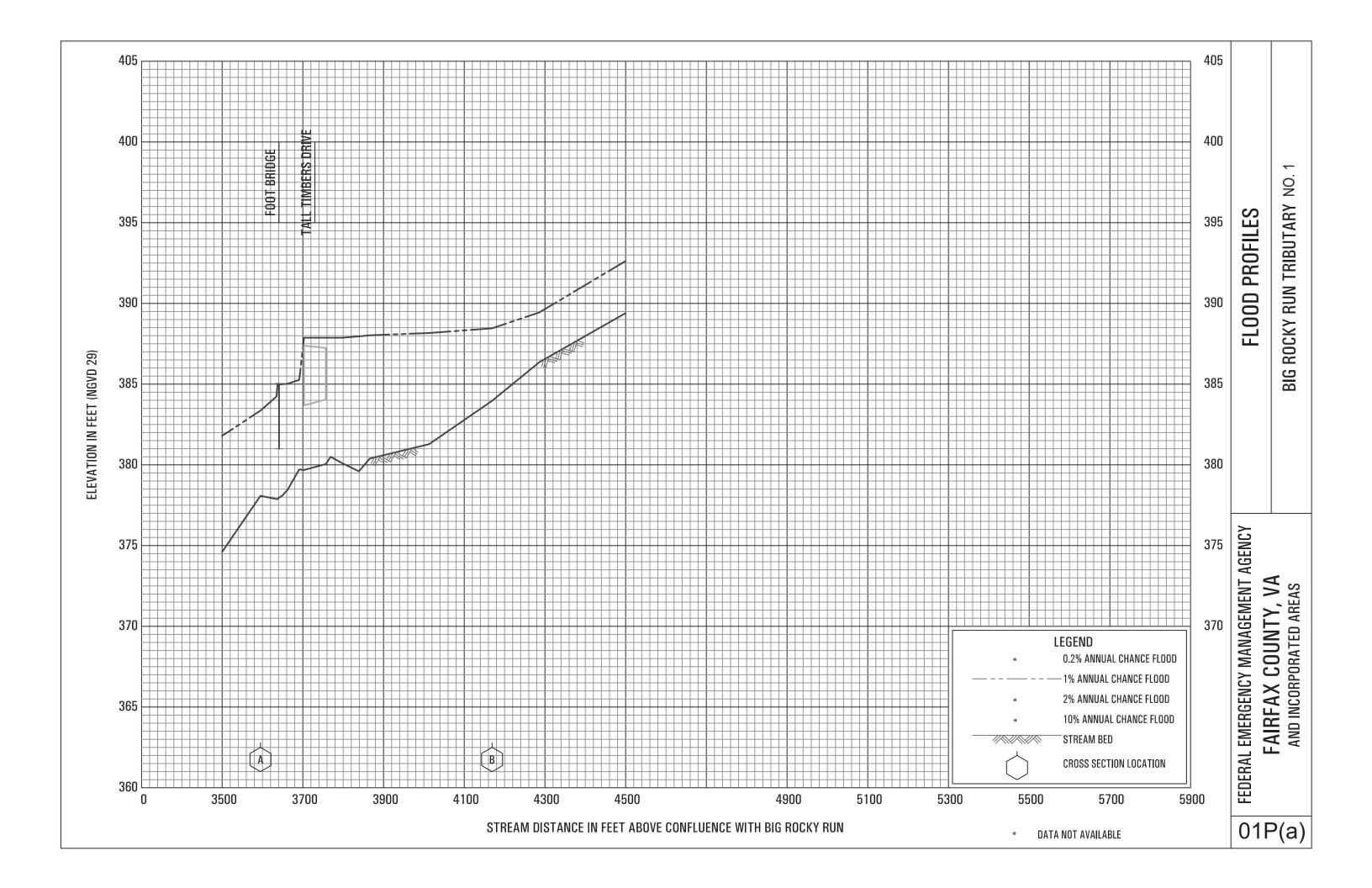
Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA, Mitigation Division, 6th Floor, 615 Chestnut Street, Philadelphia, Pennsylvania 19106-4404.

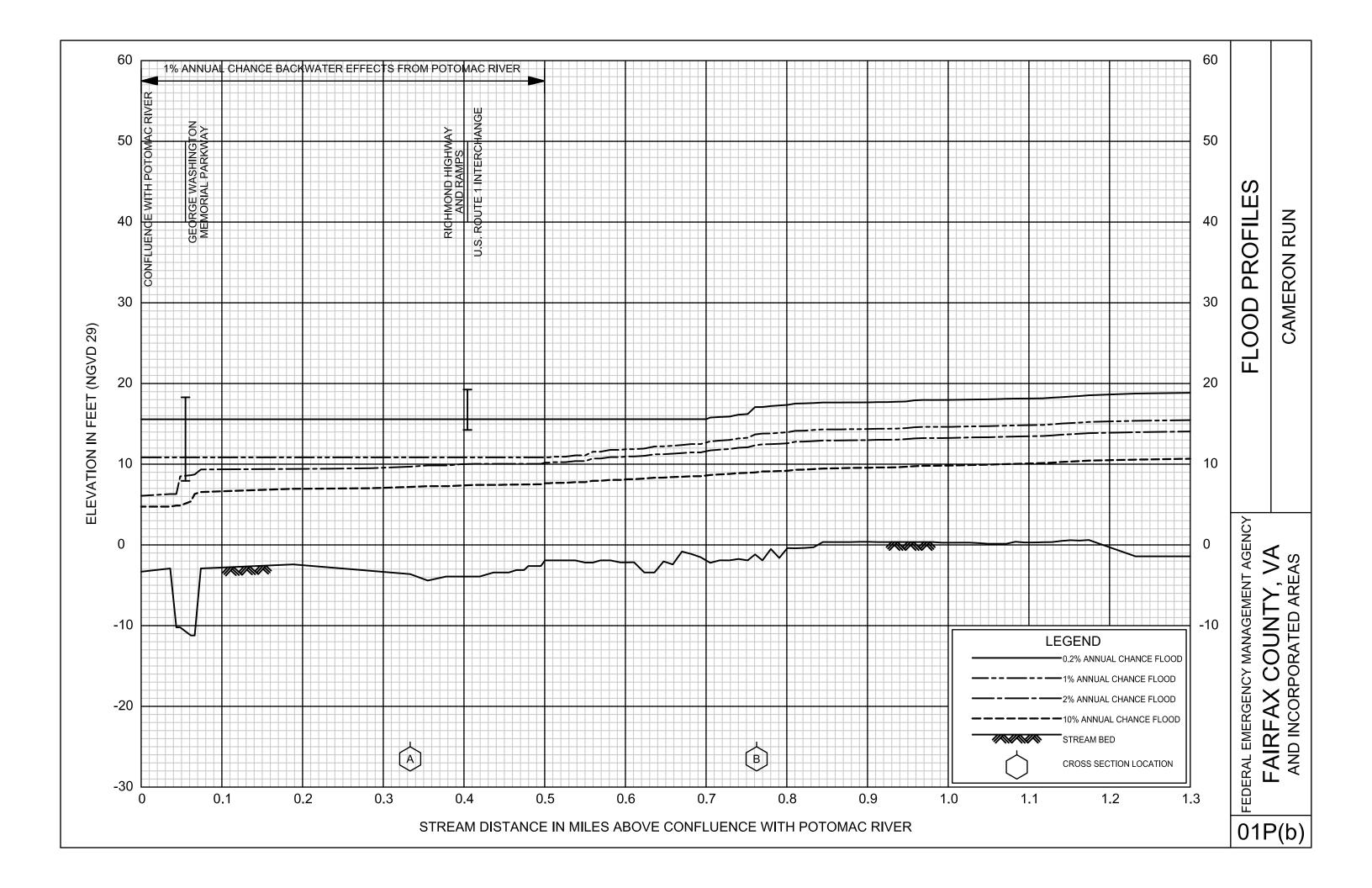
9.0 BIBLIOGRAPHY AND REFERENCES

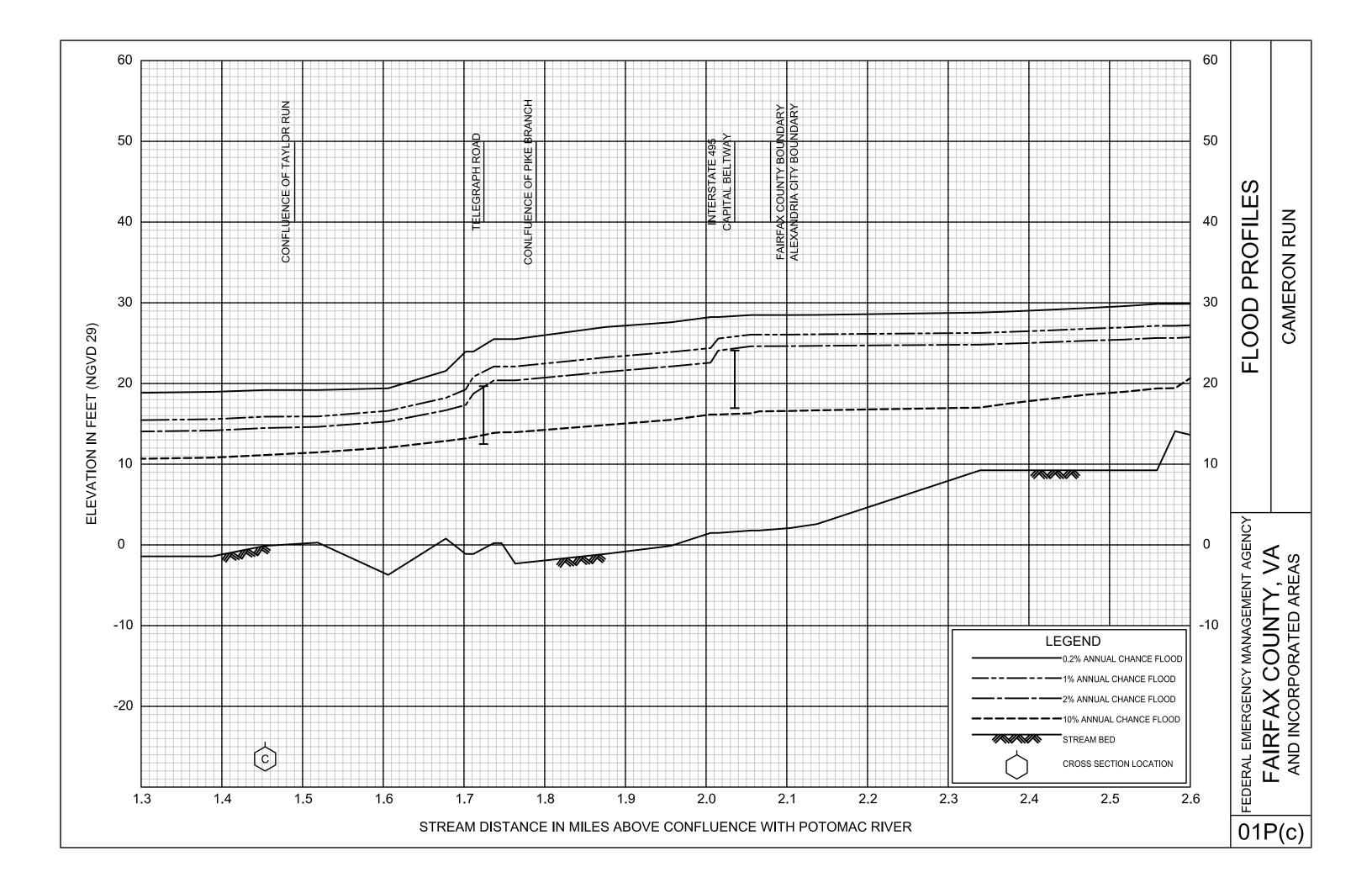
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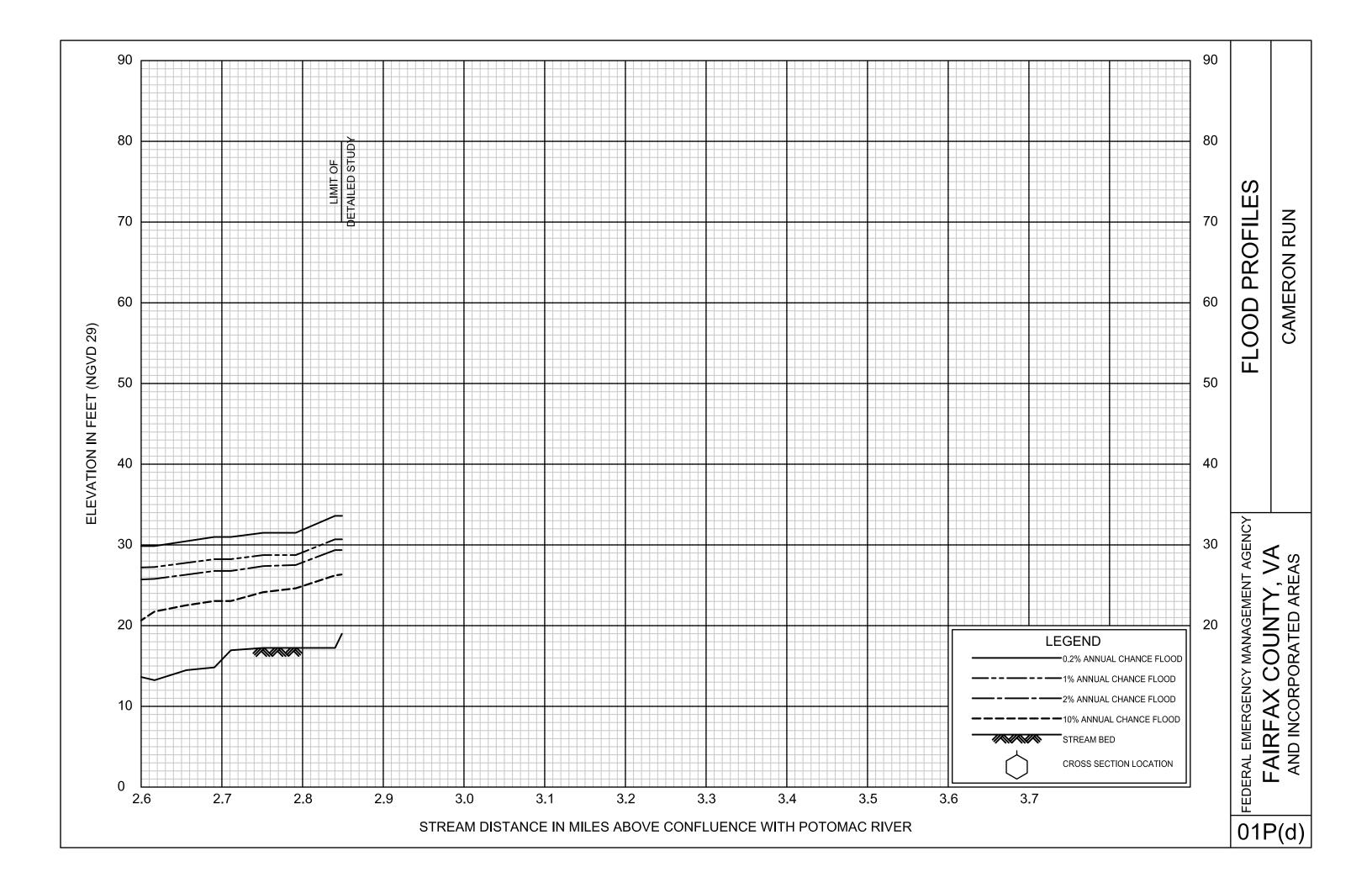
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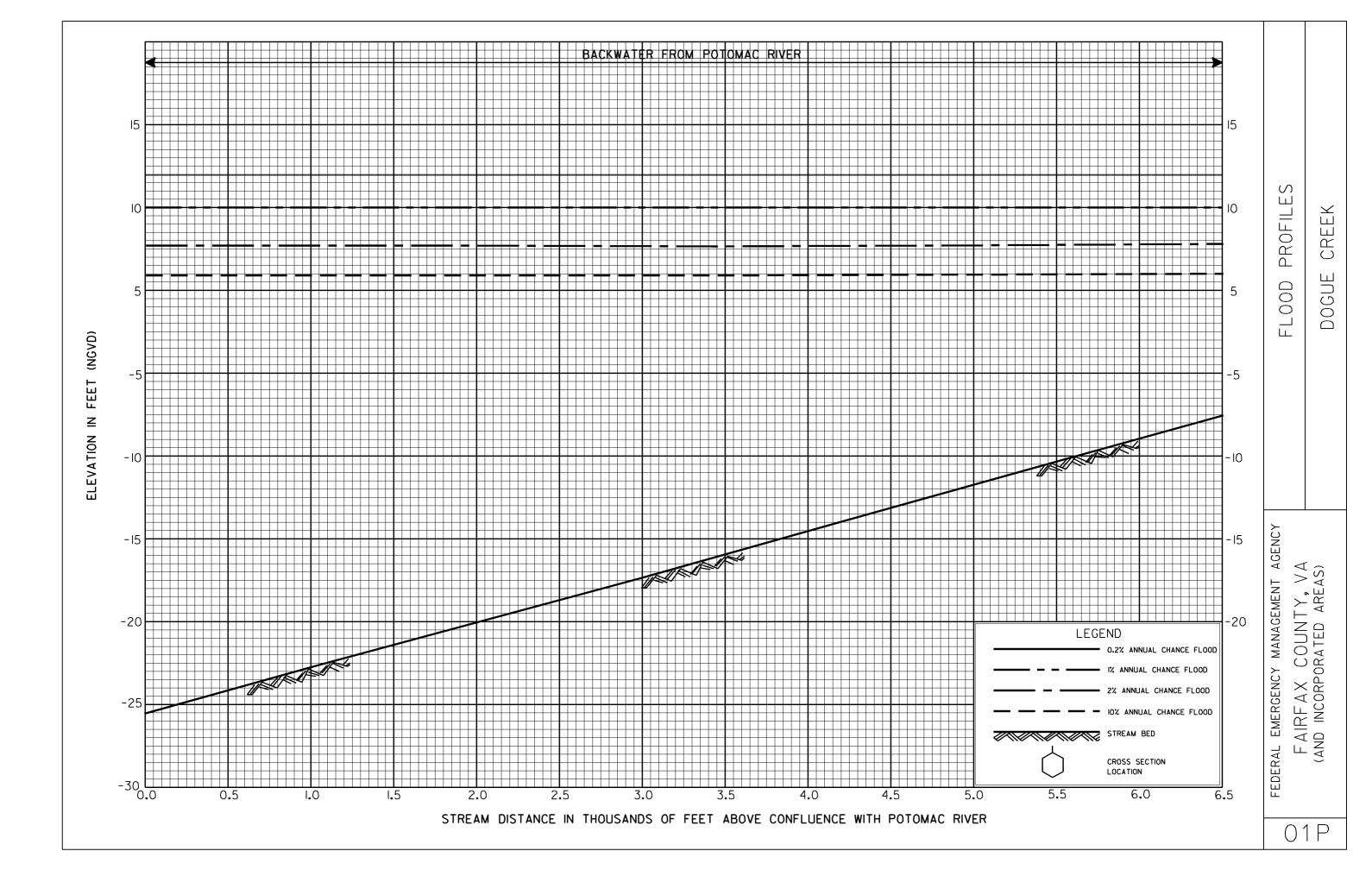
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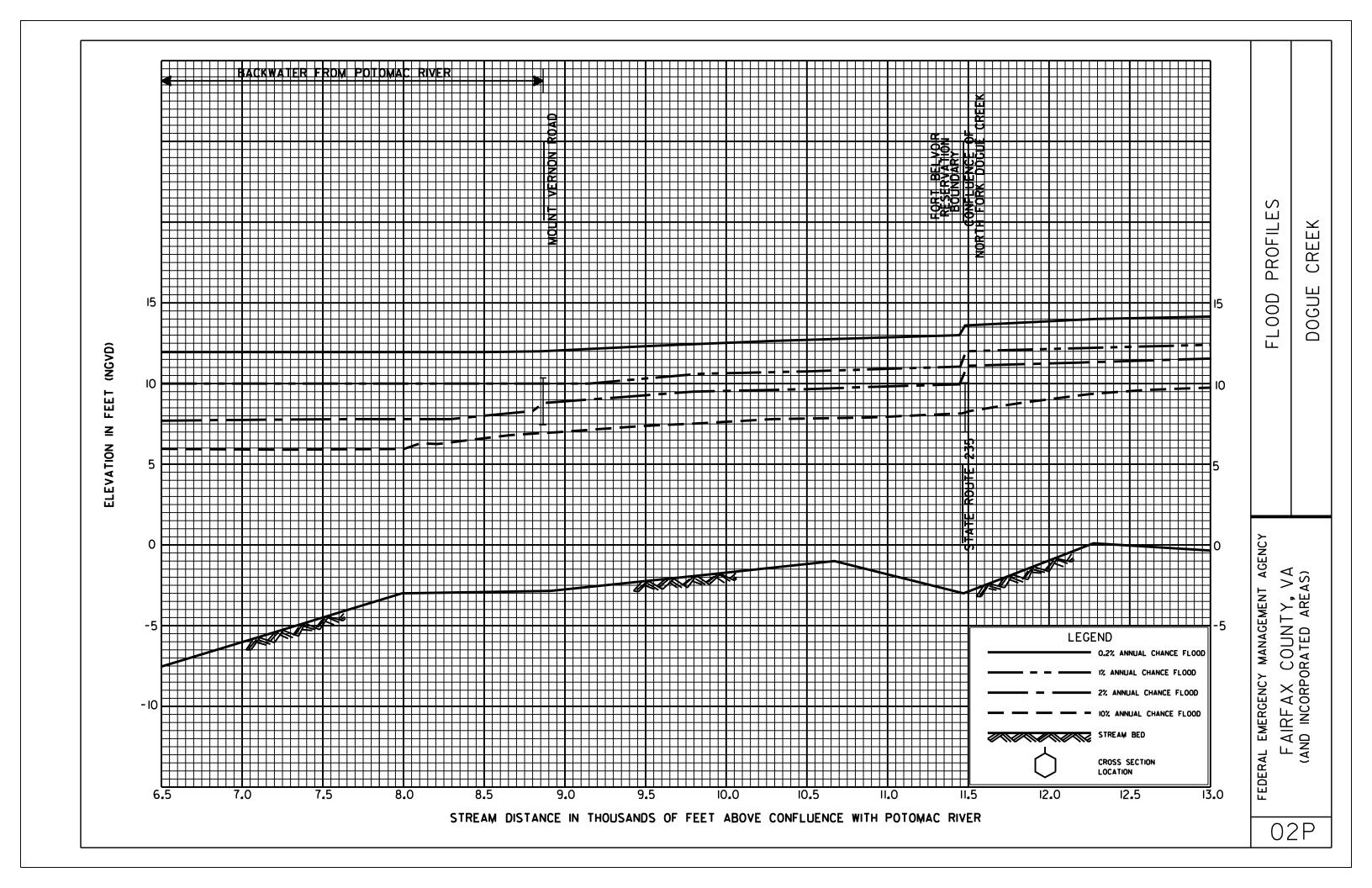


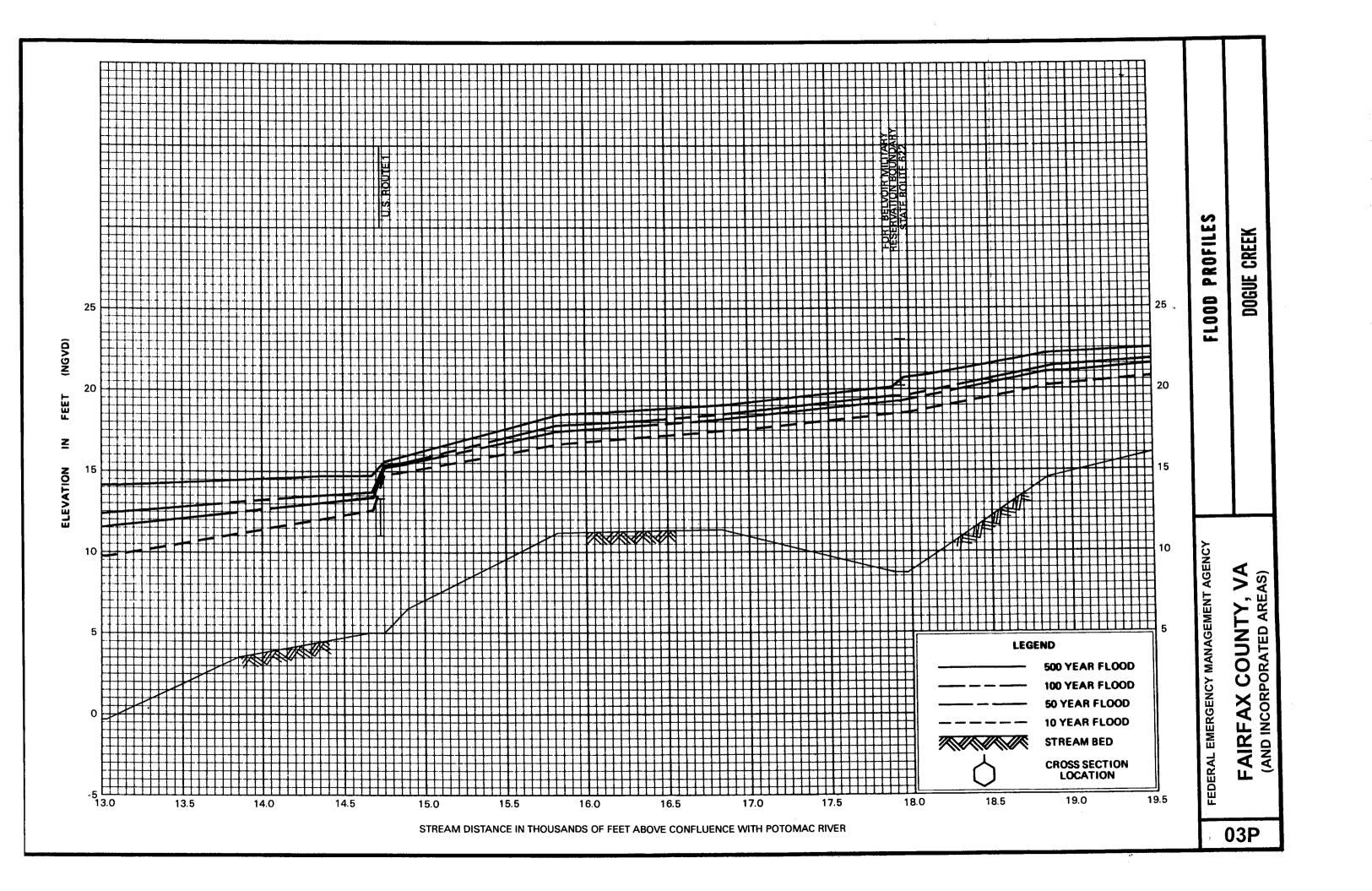


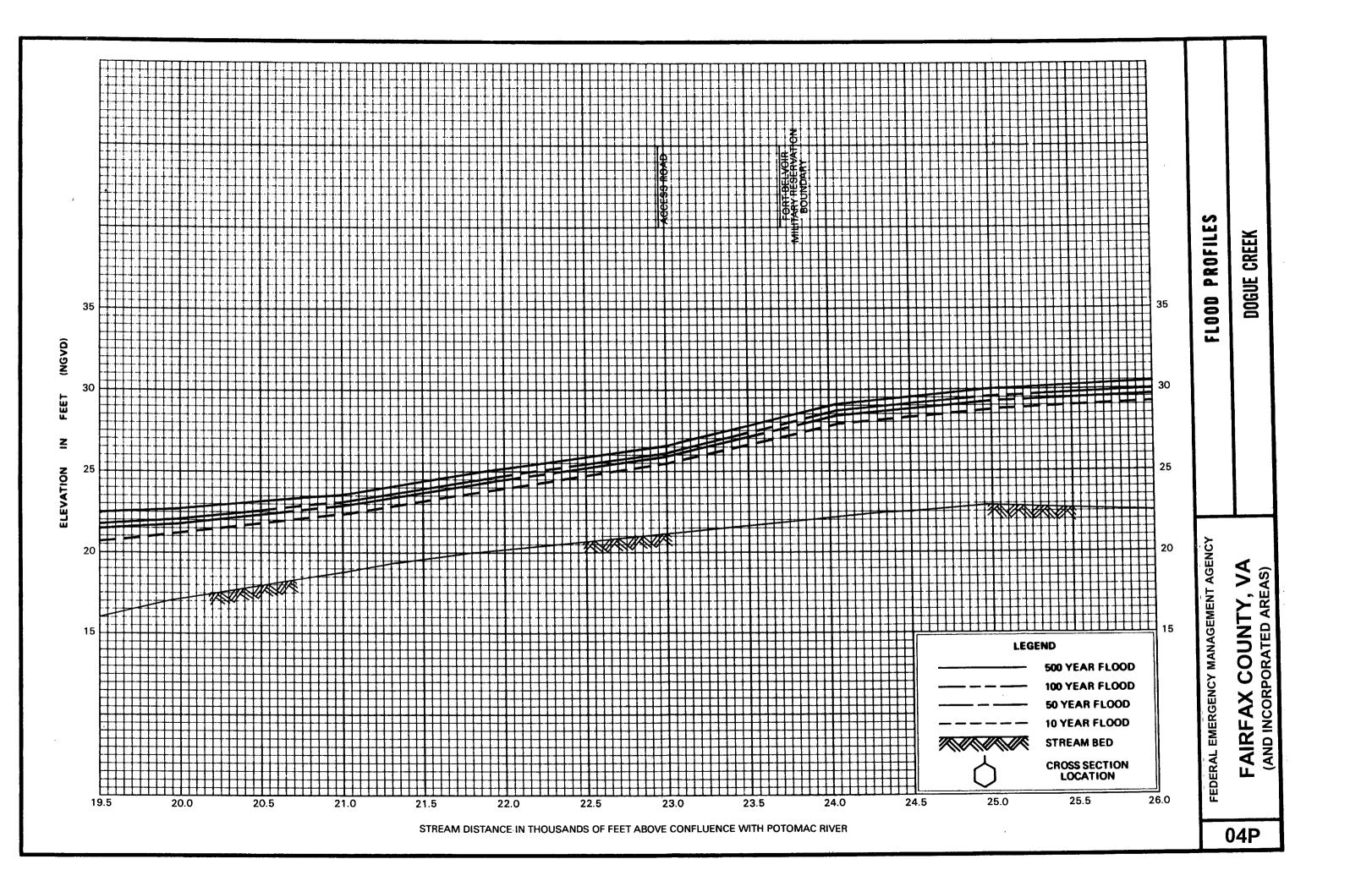


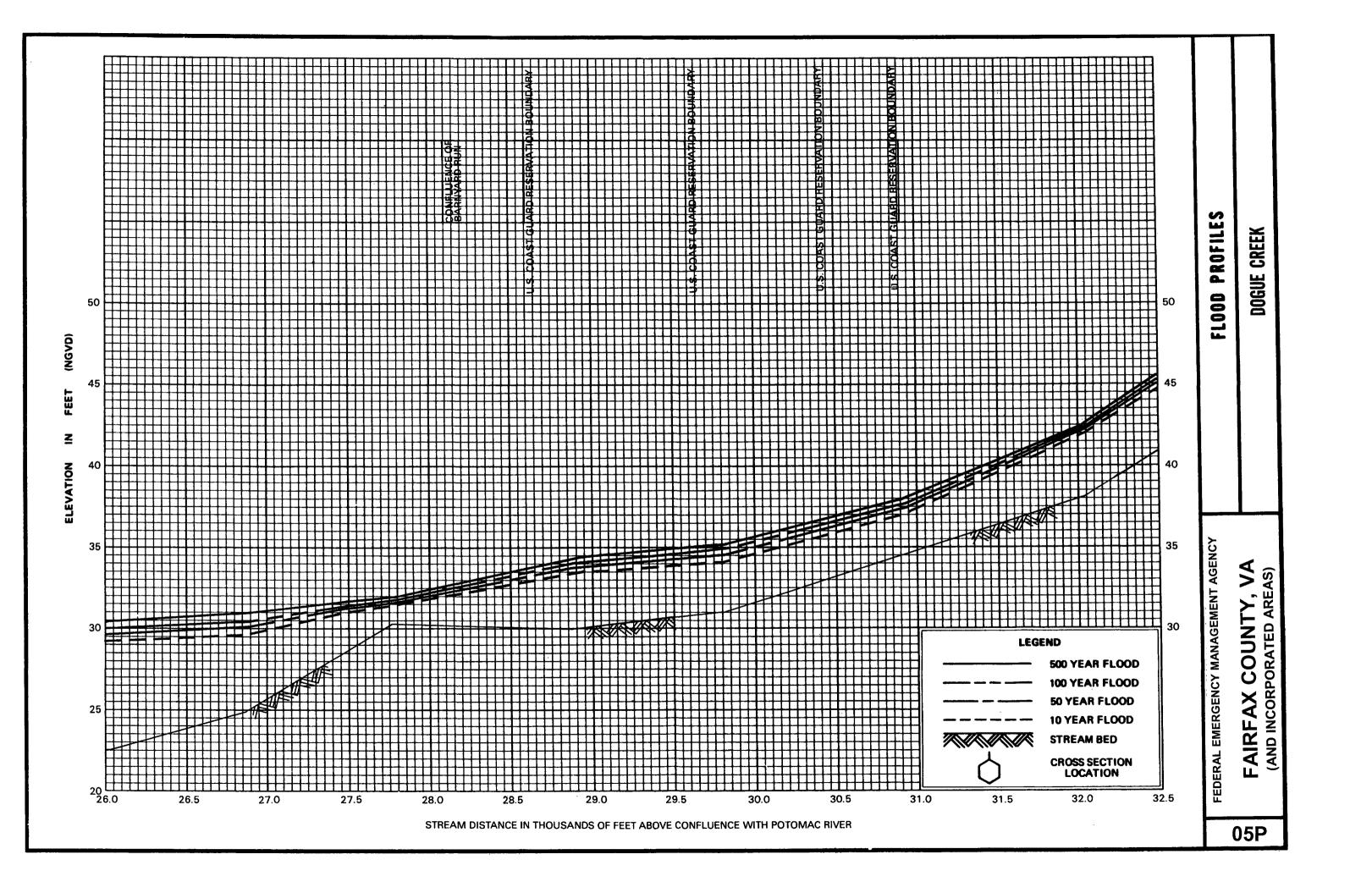


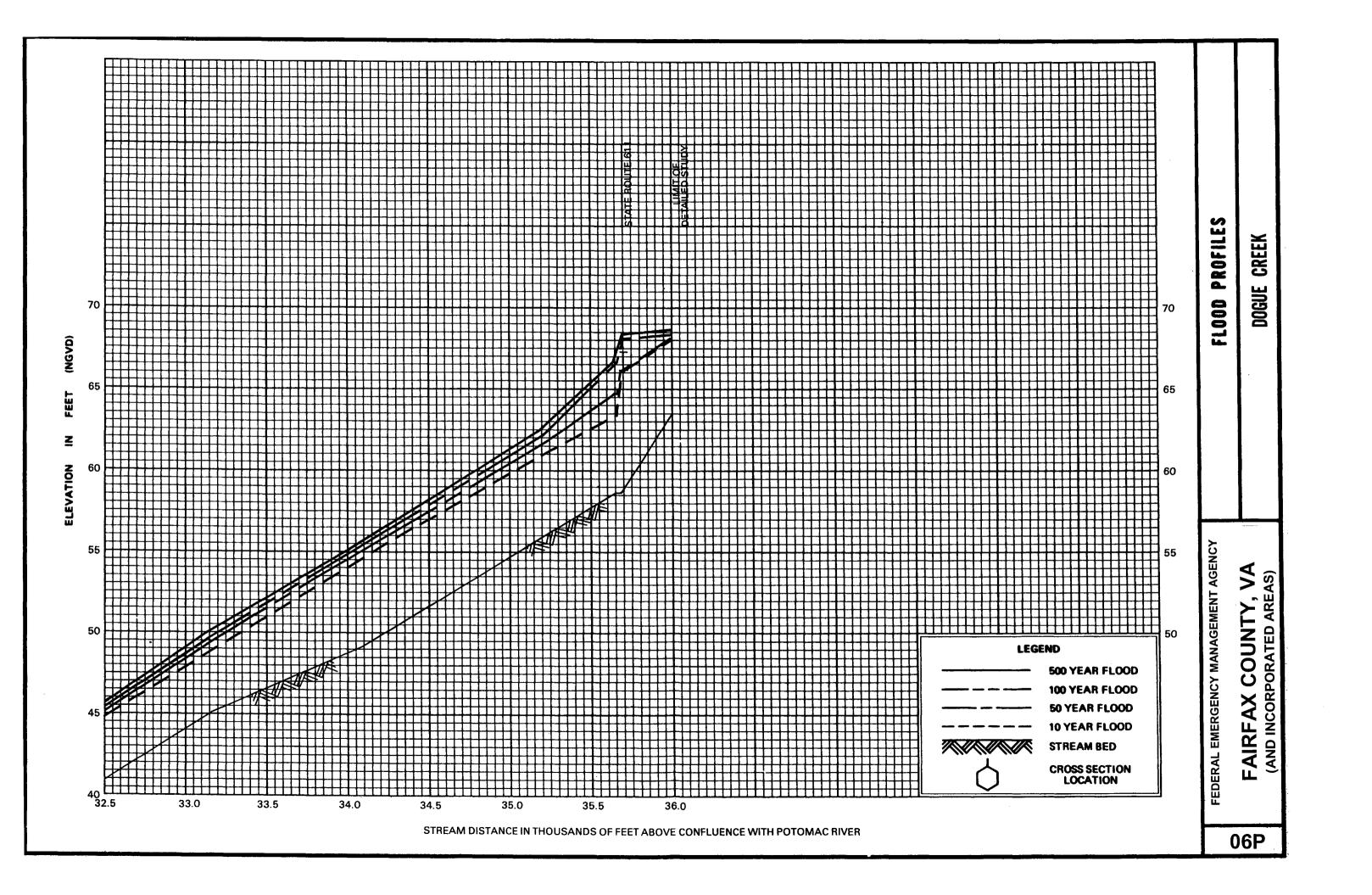


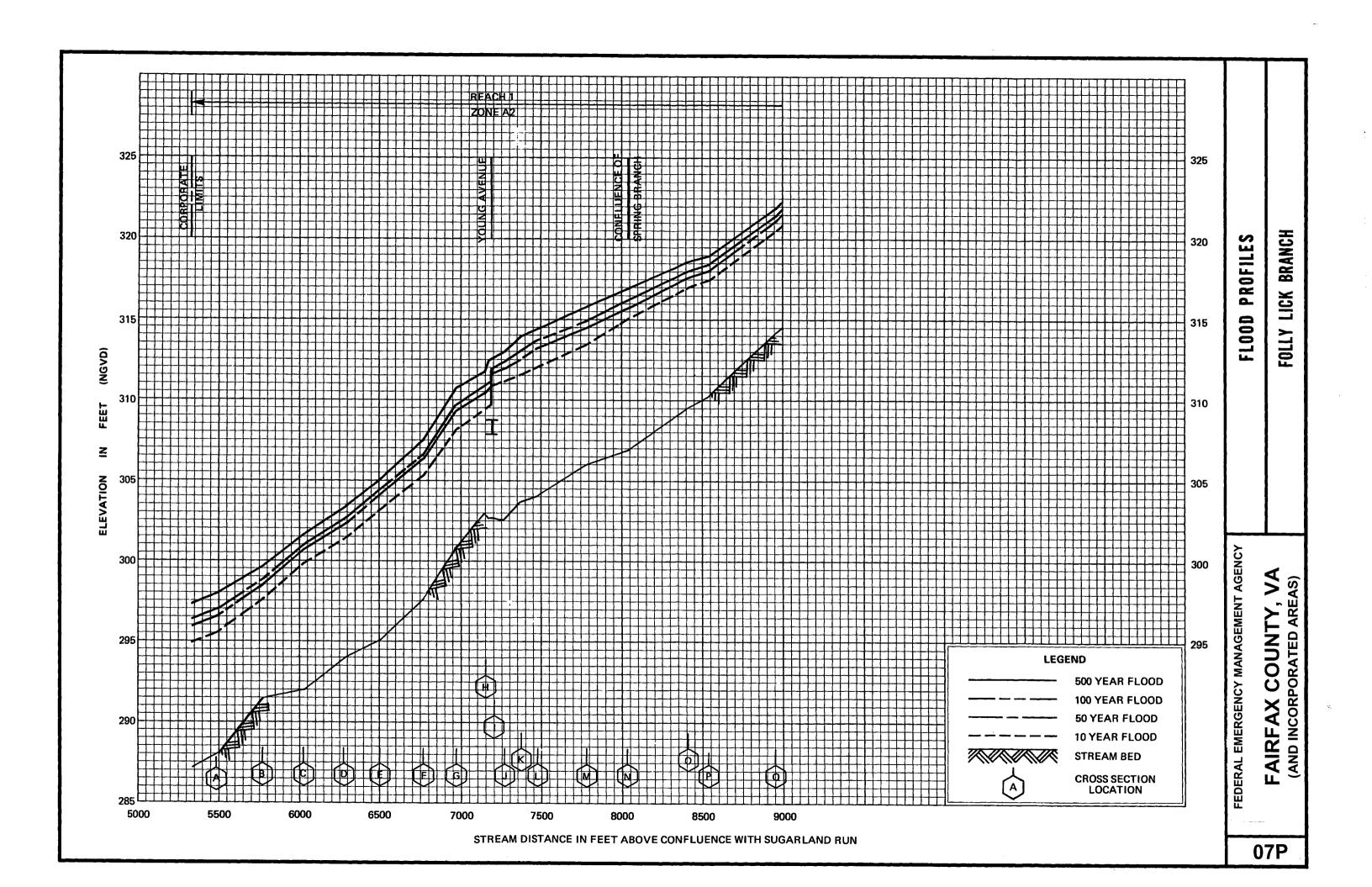


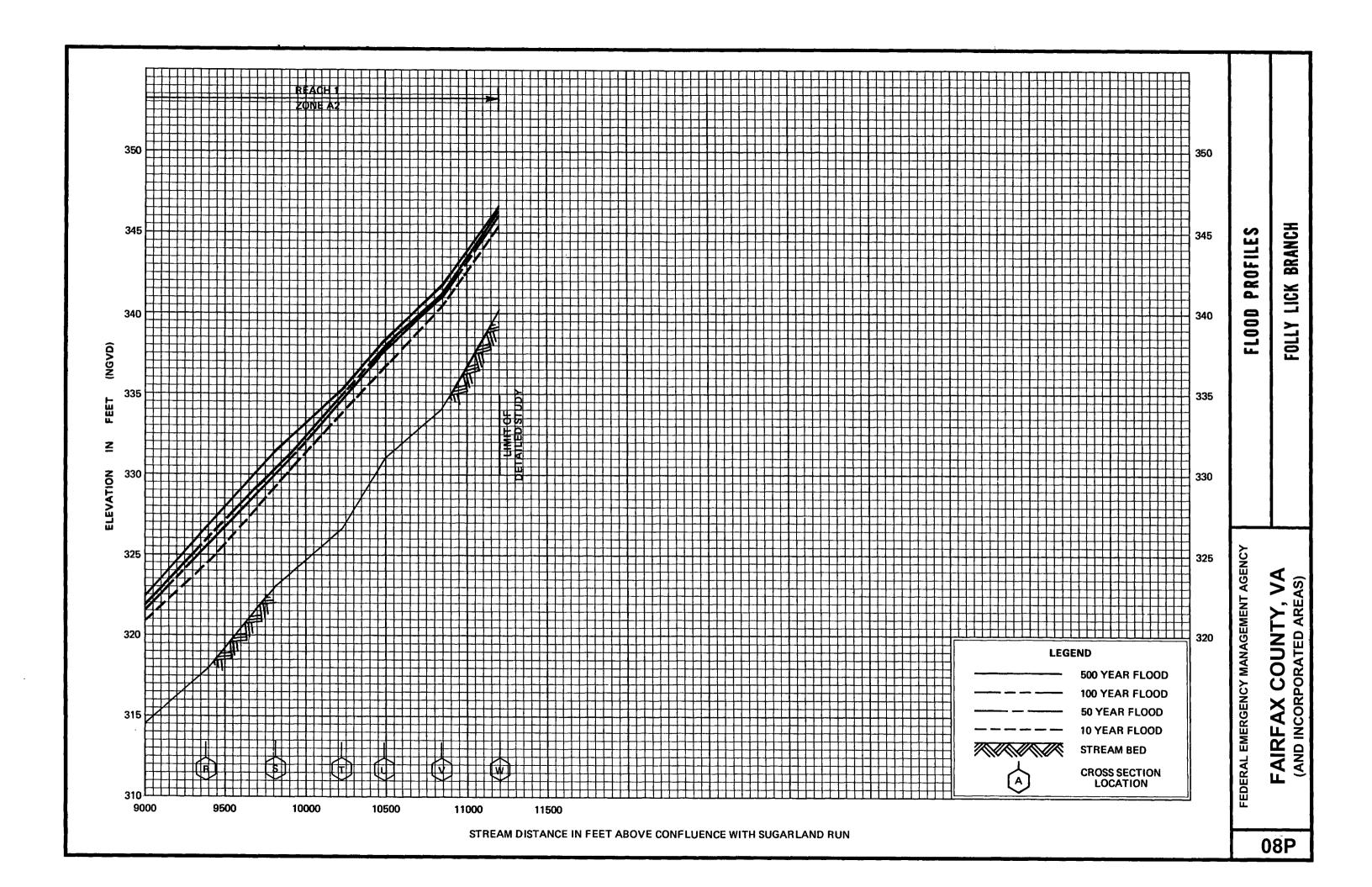


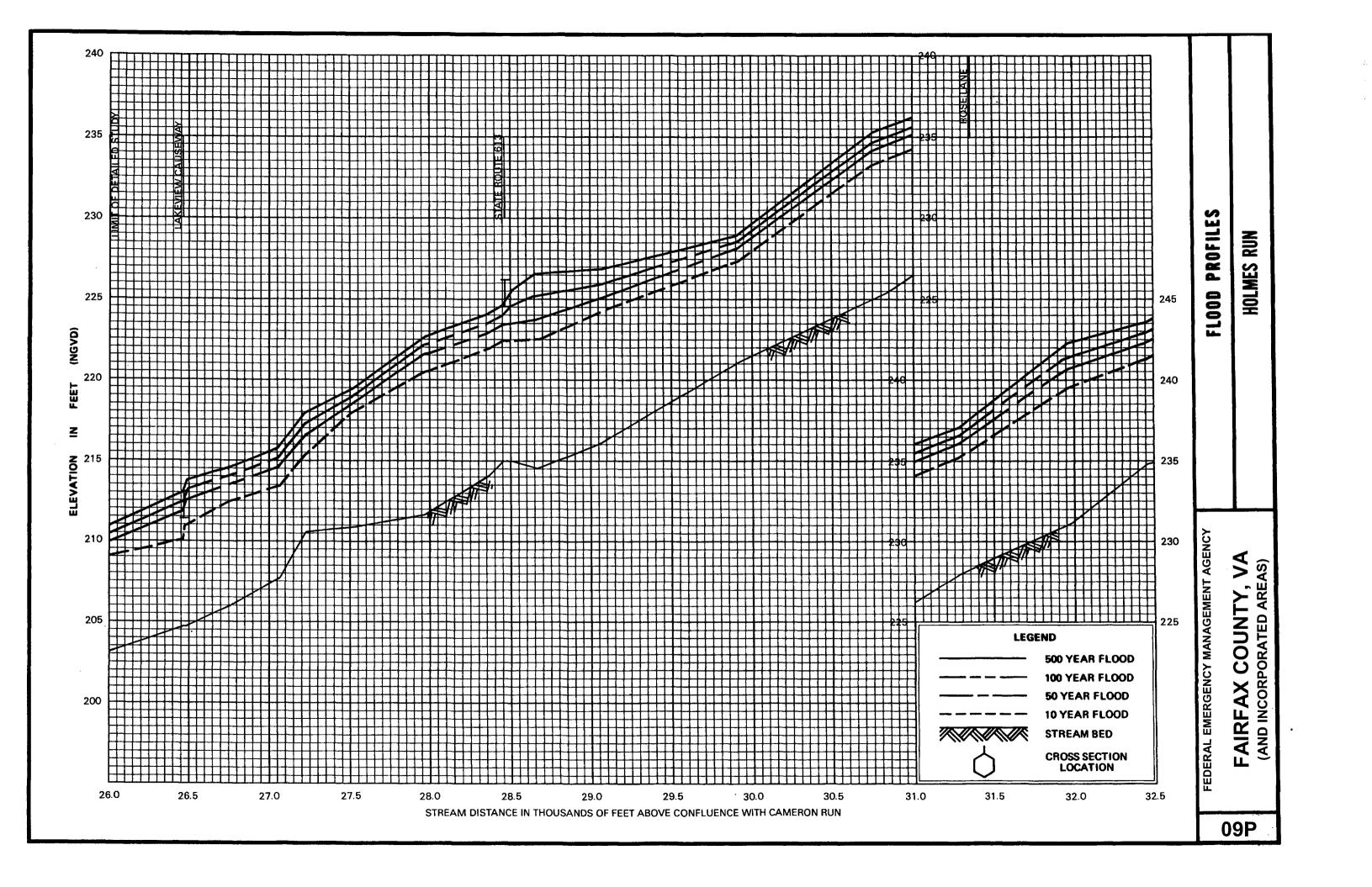


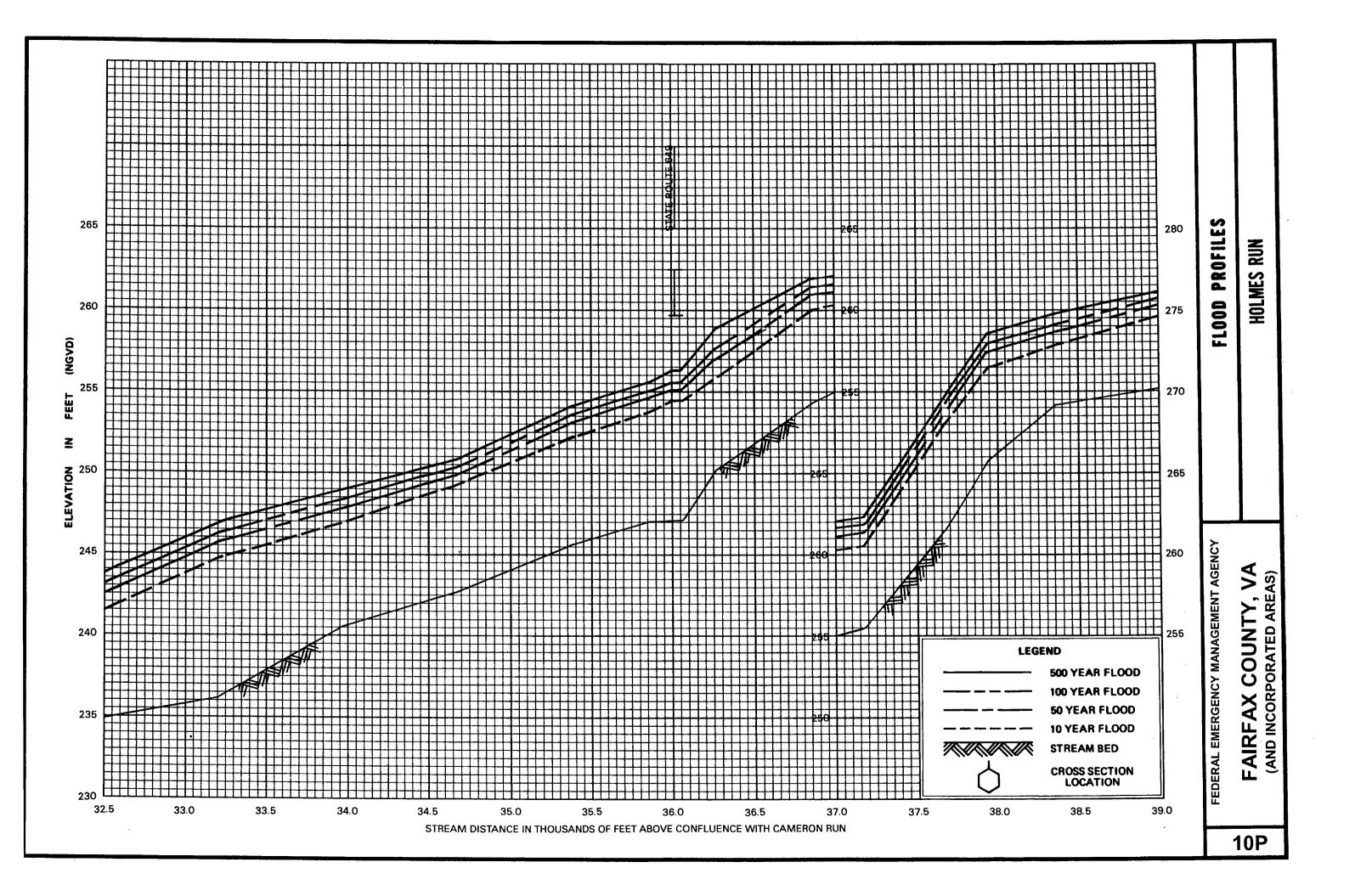


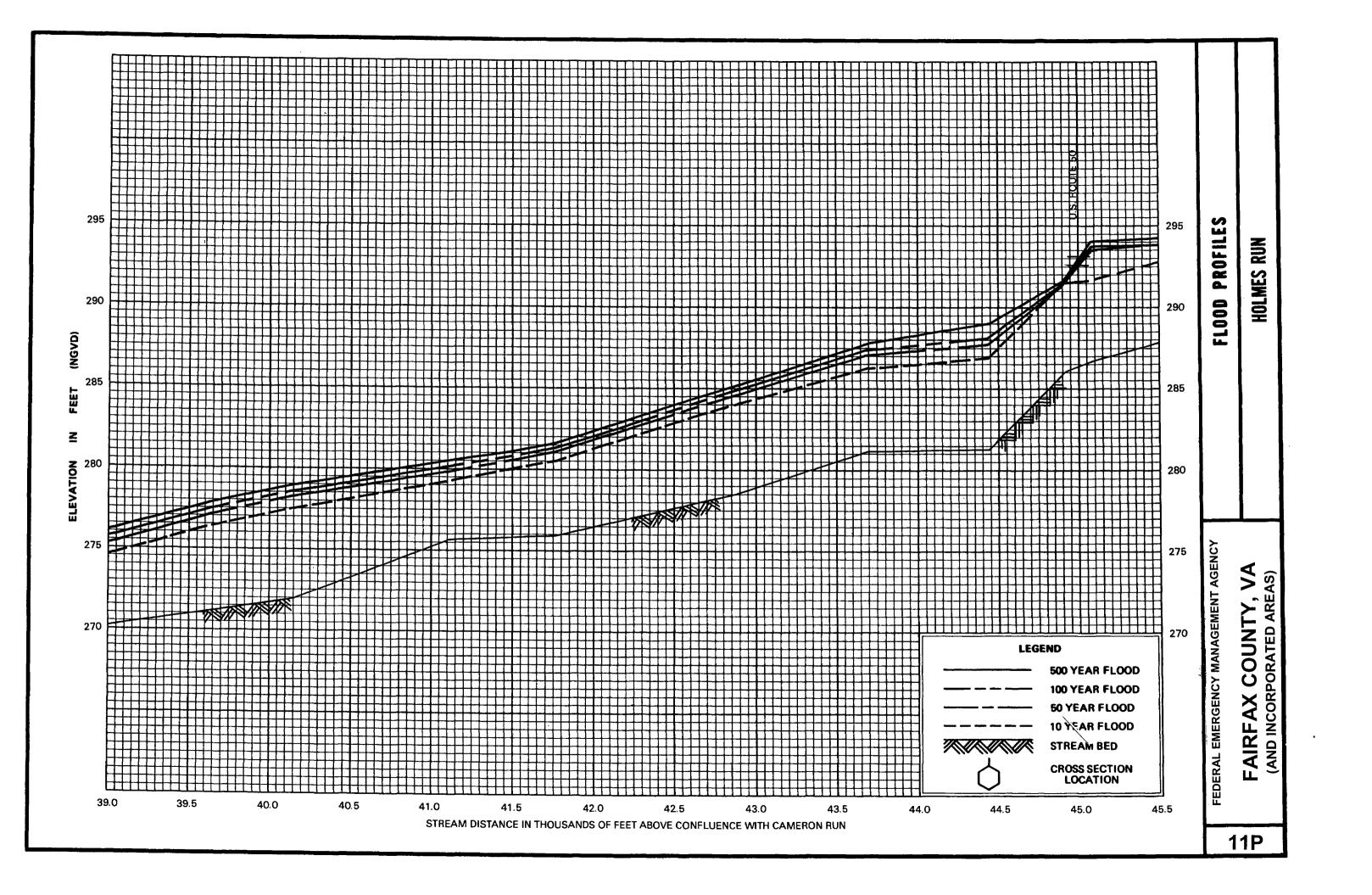


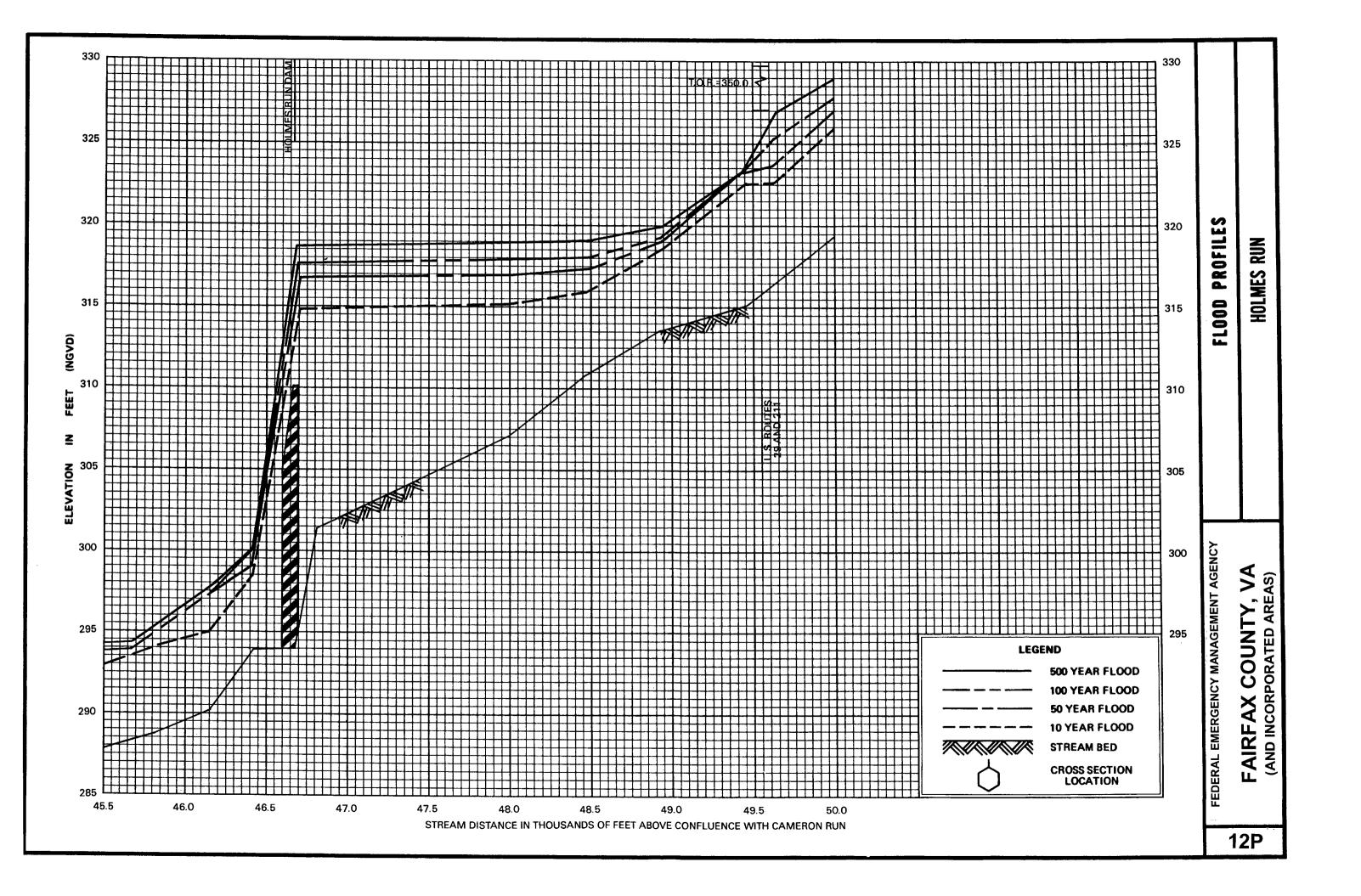


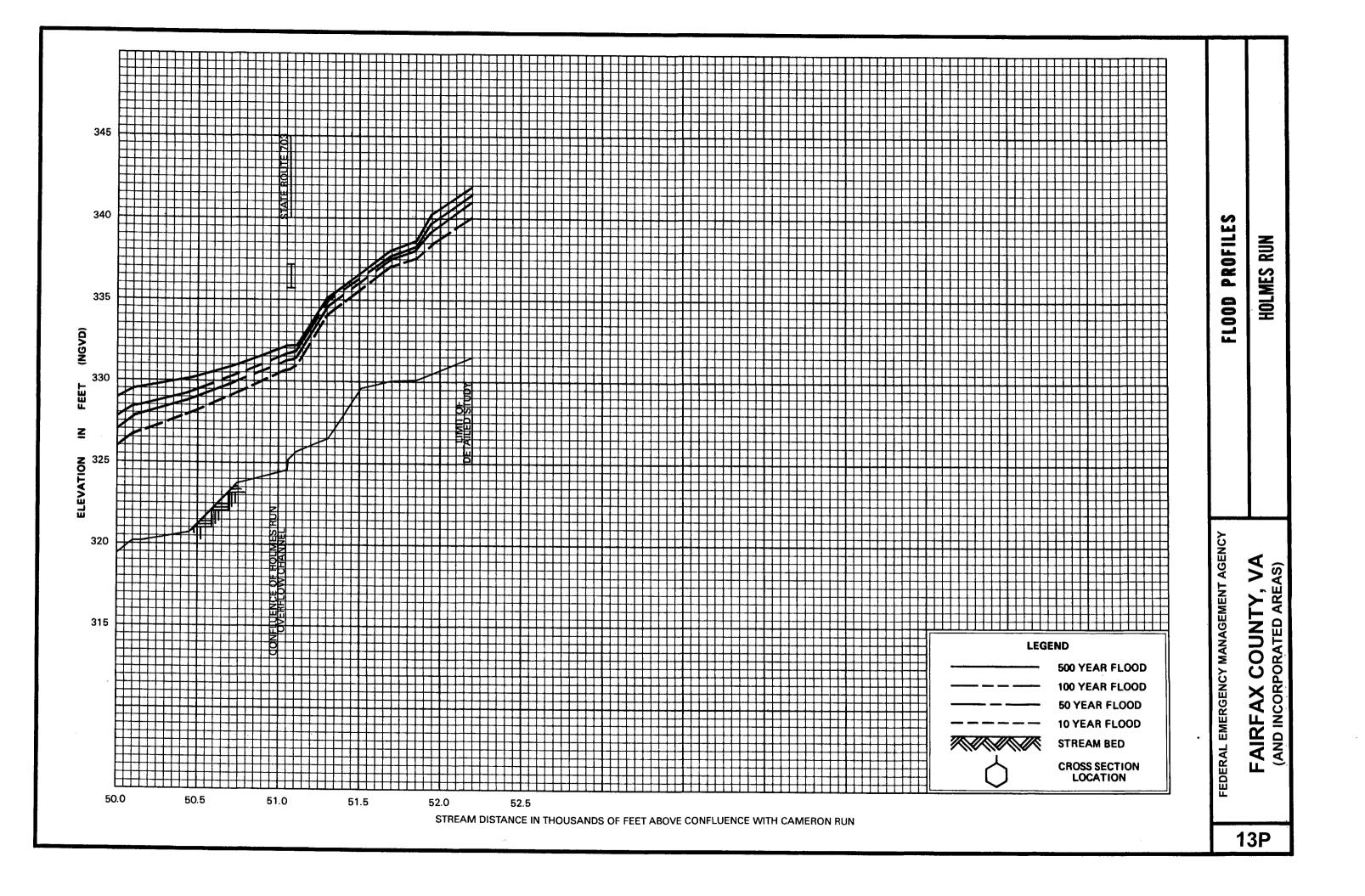


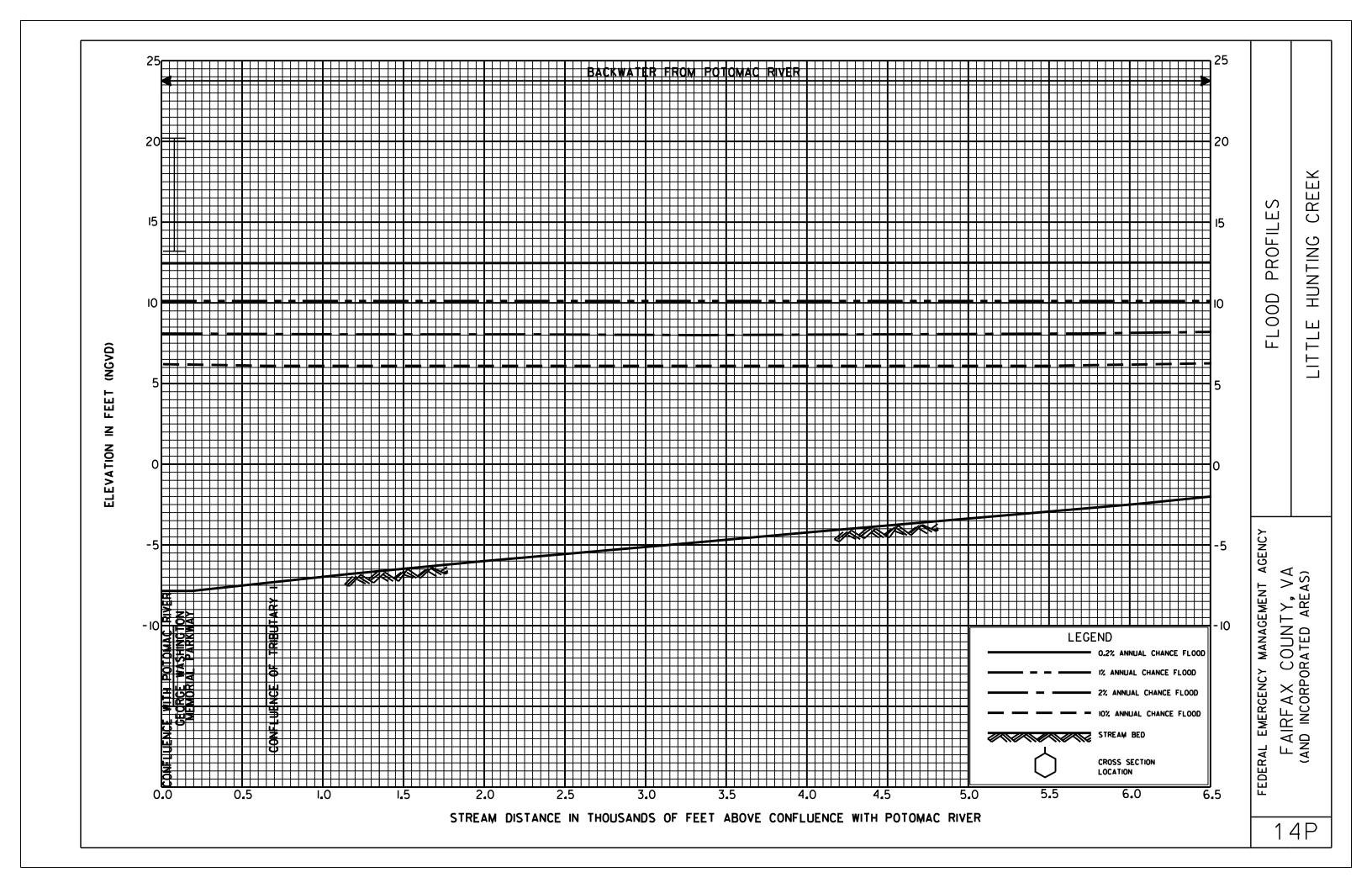


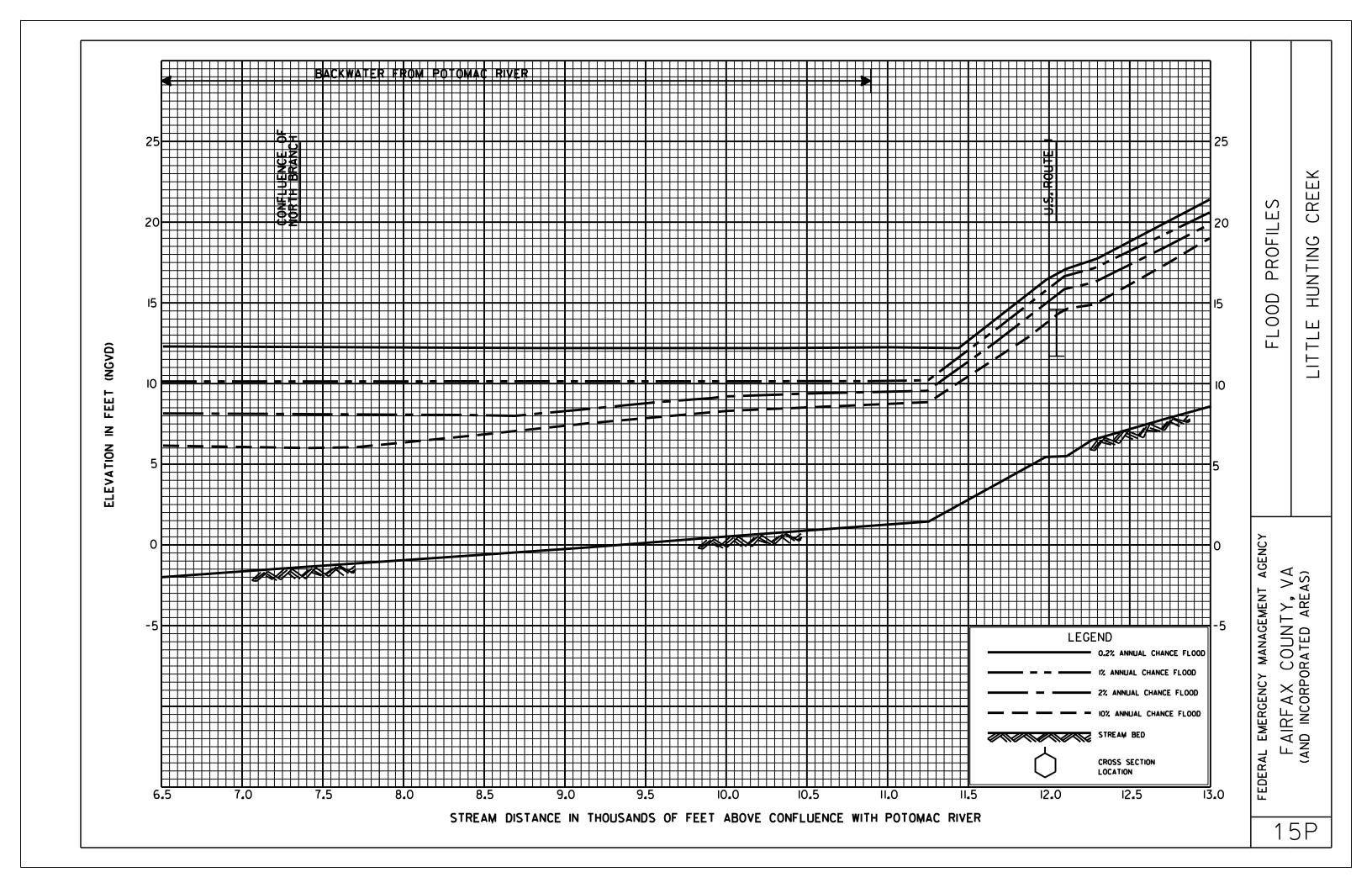


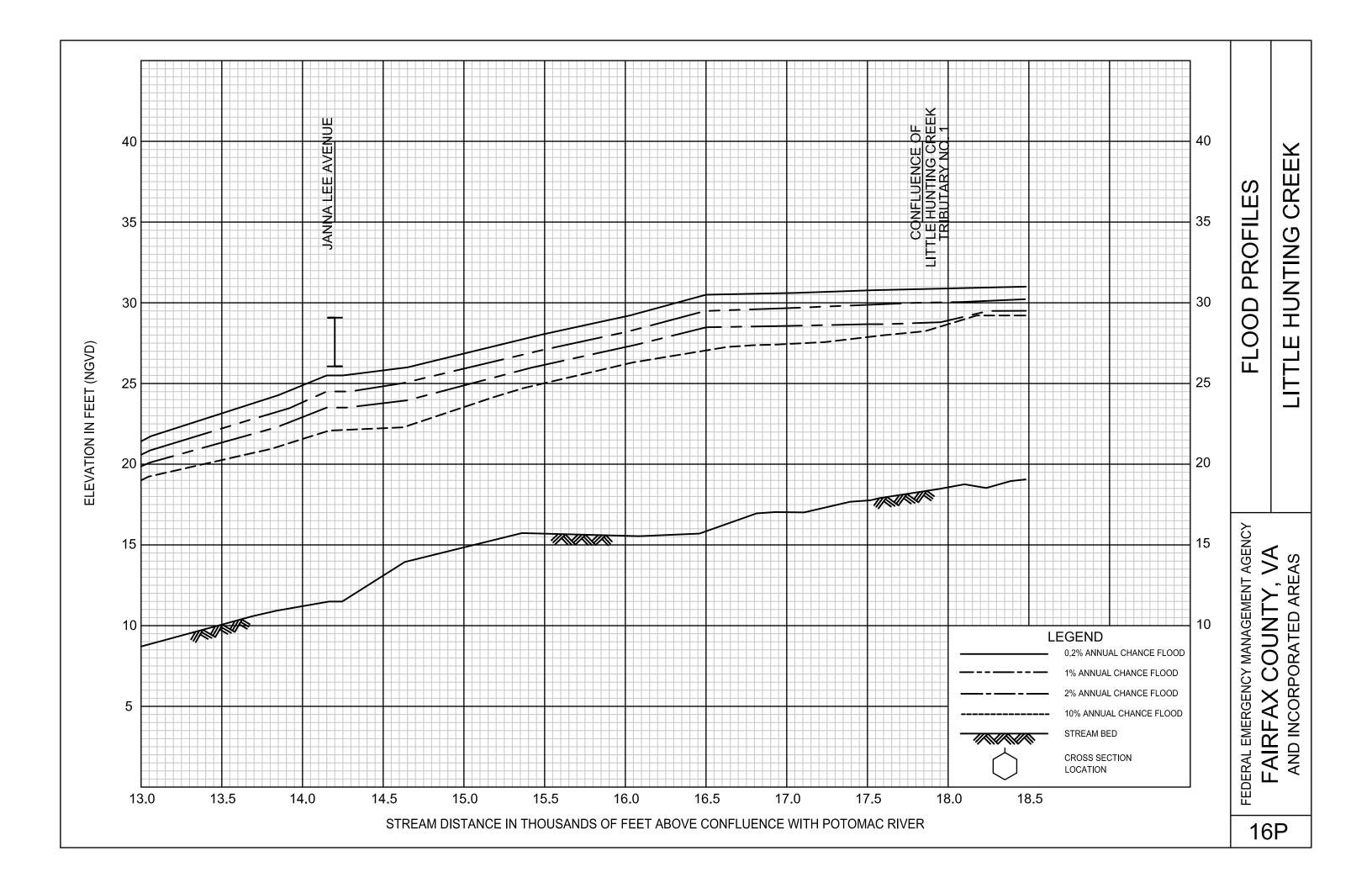


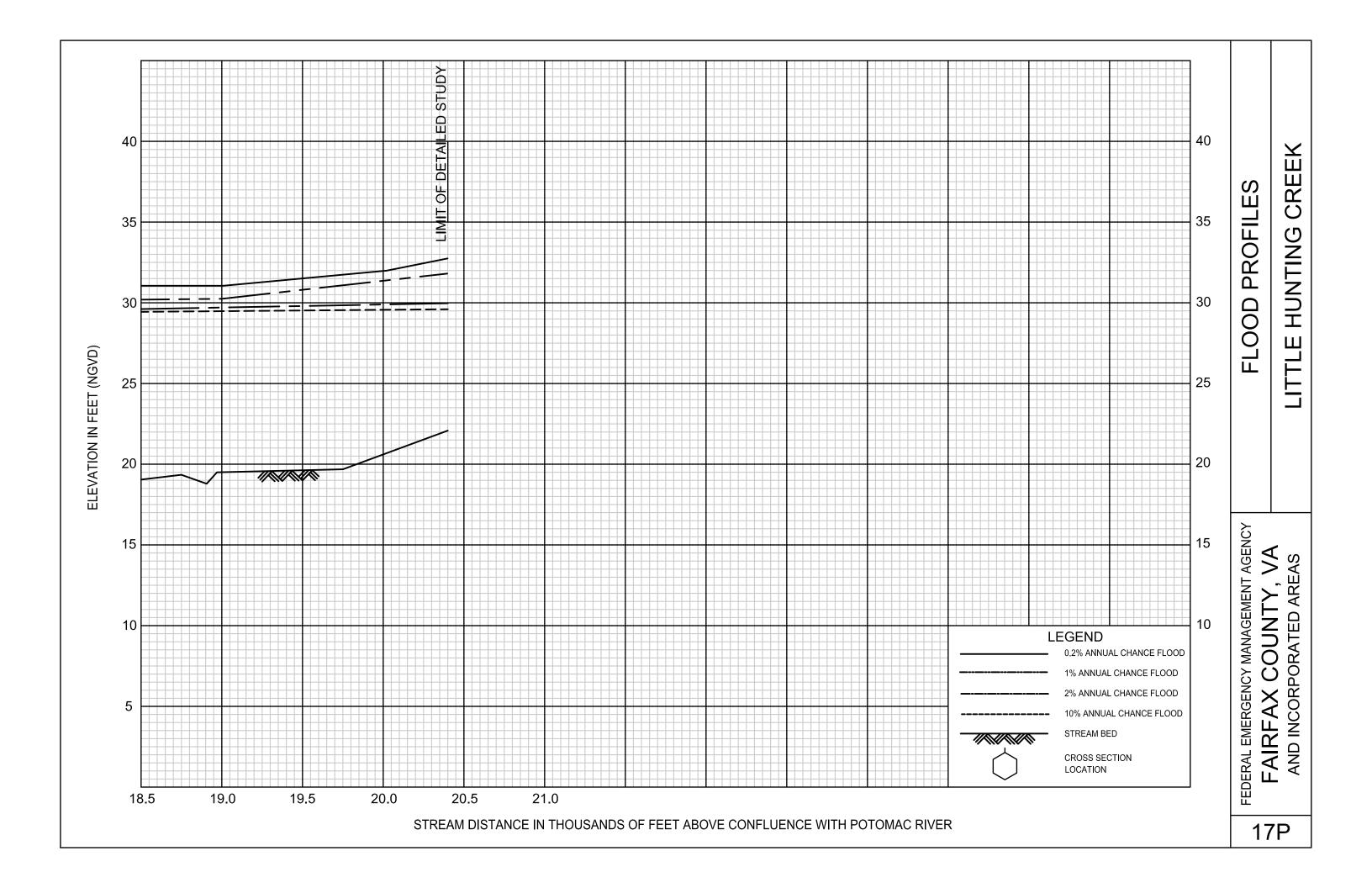


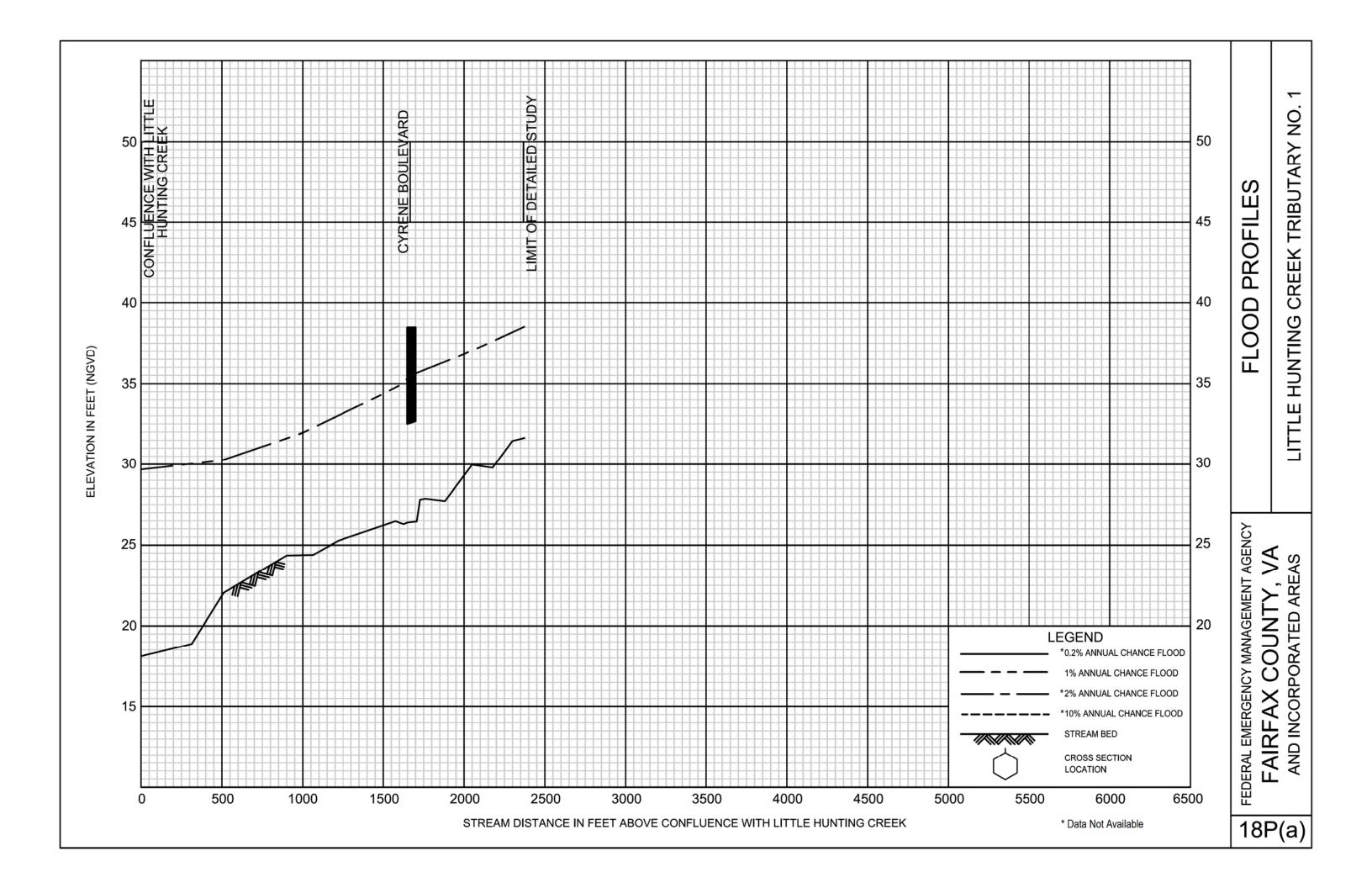


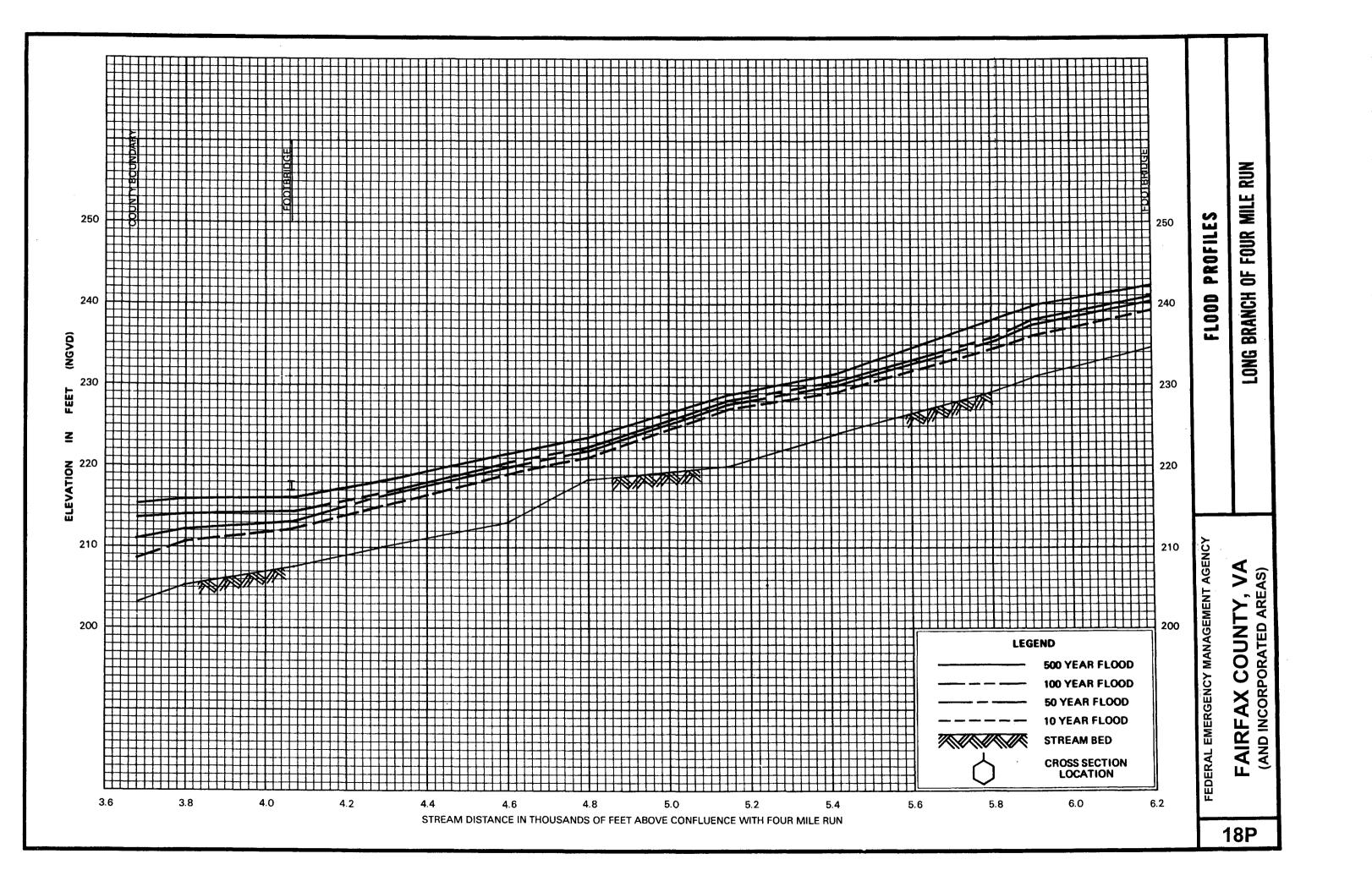


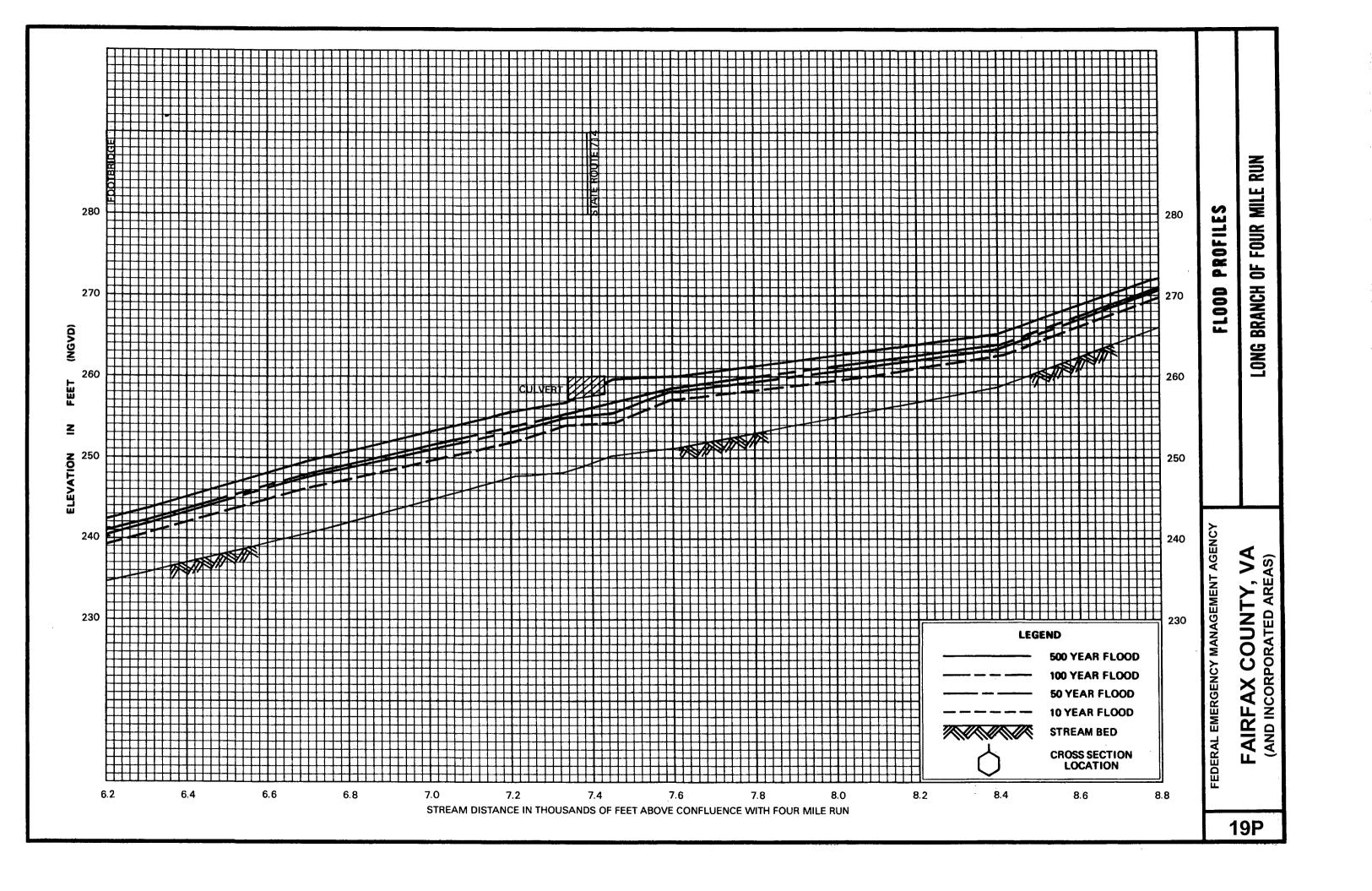


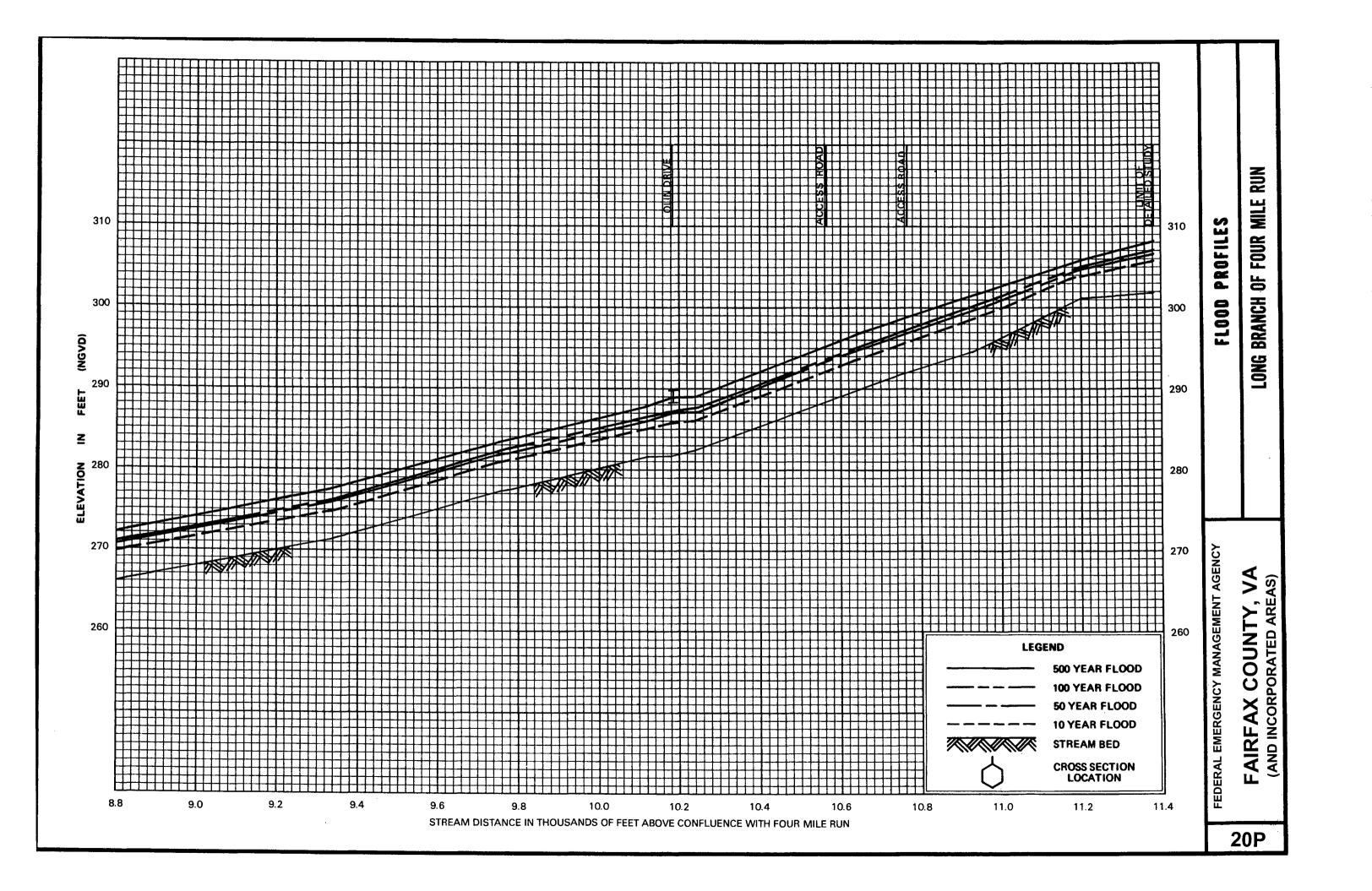


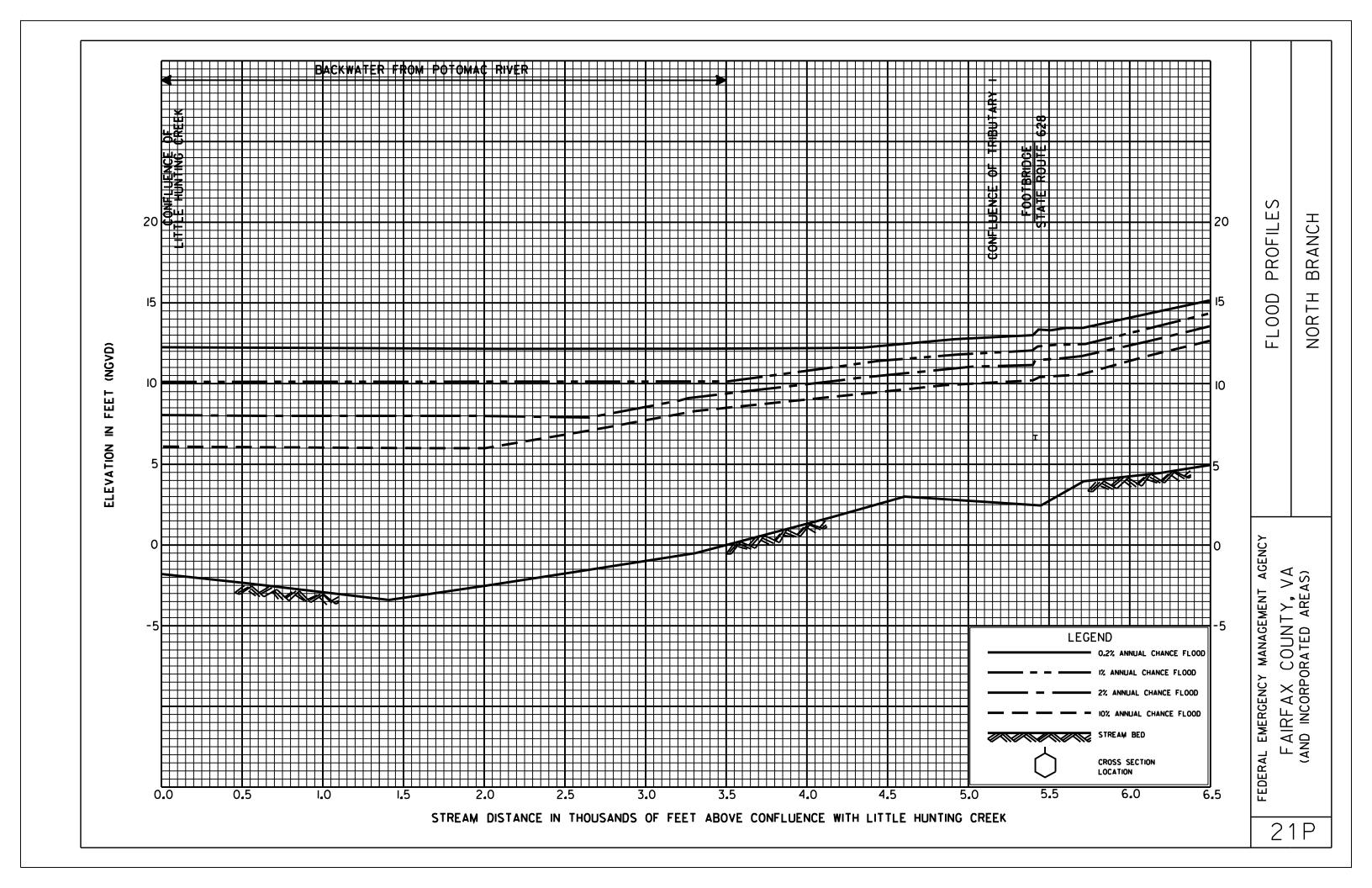


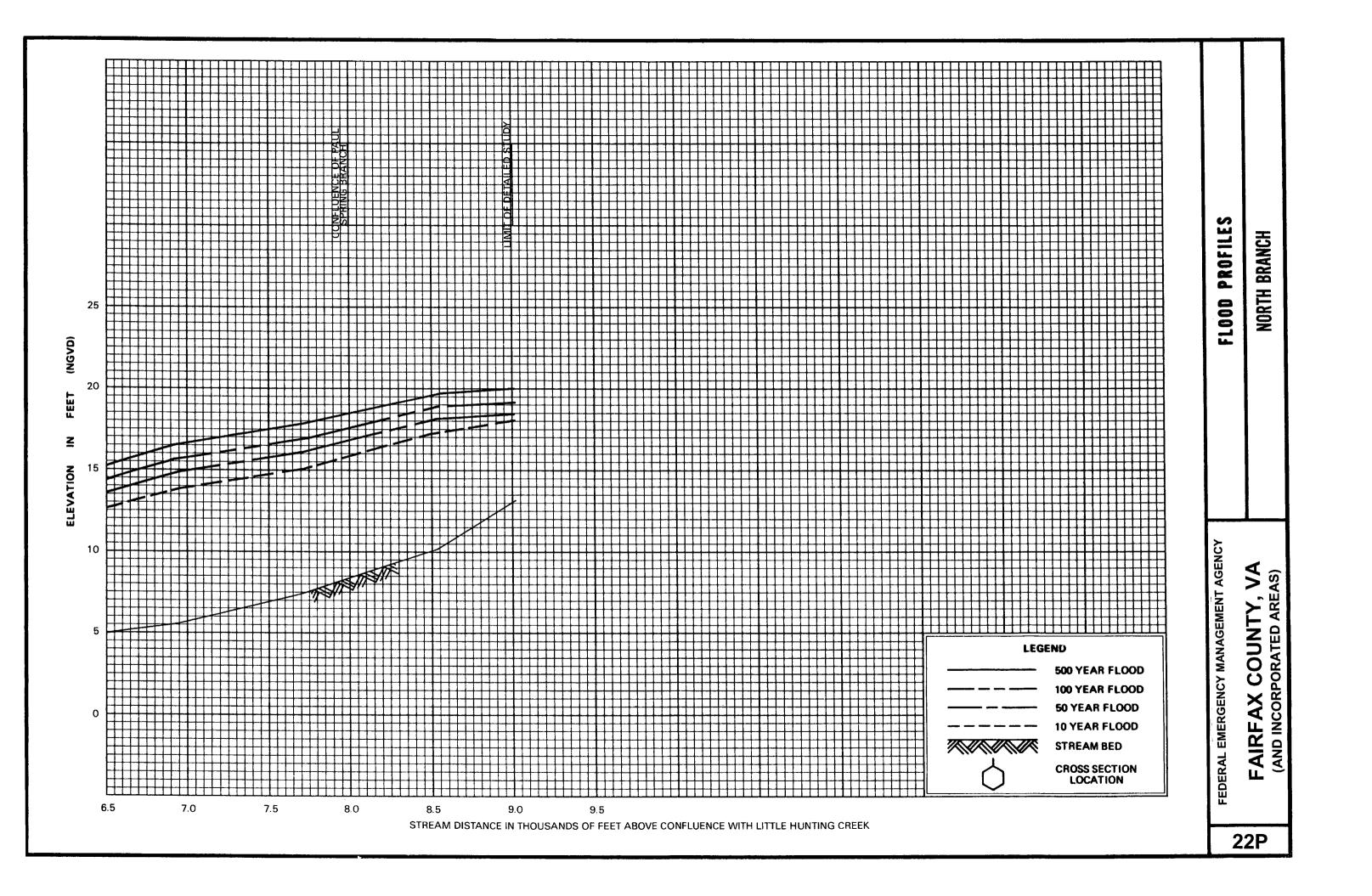


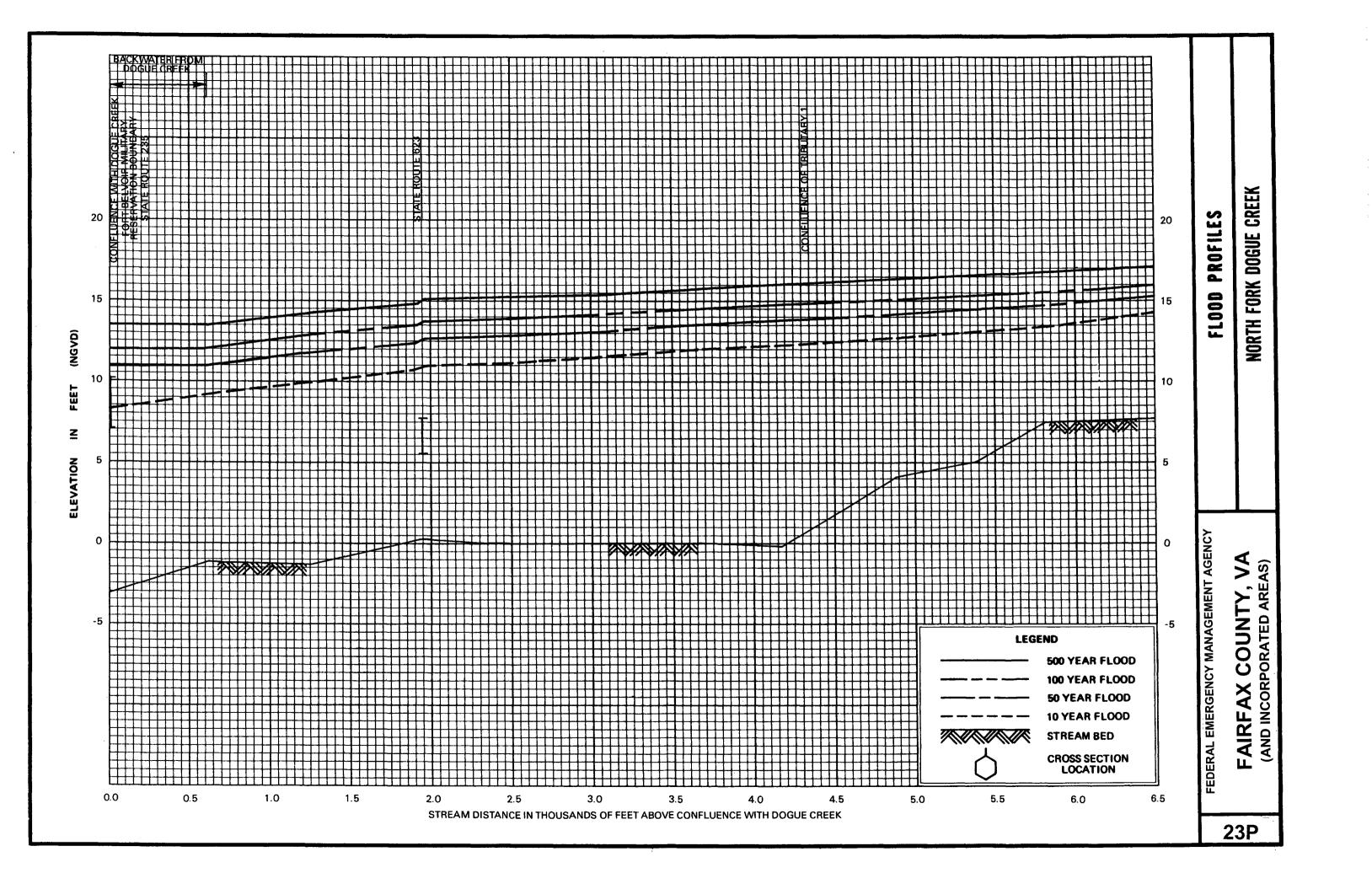


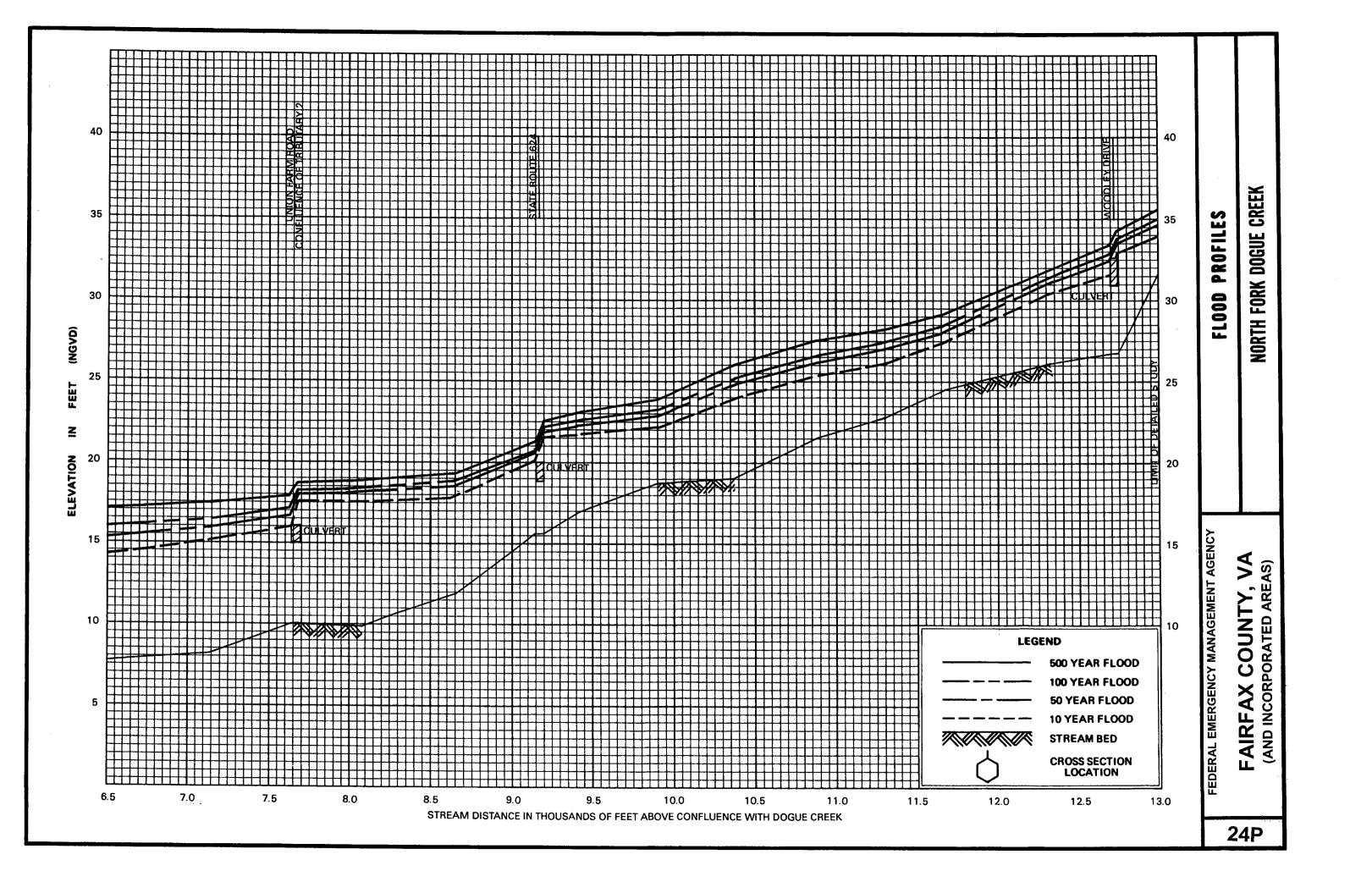


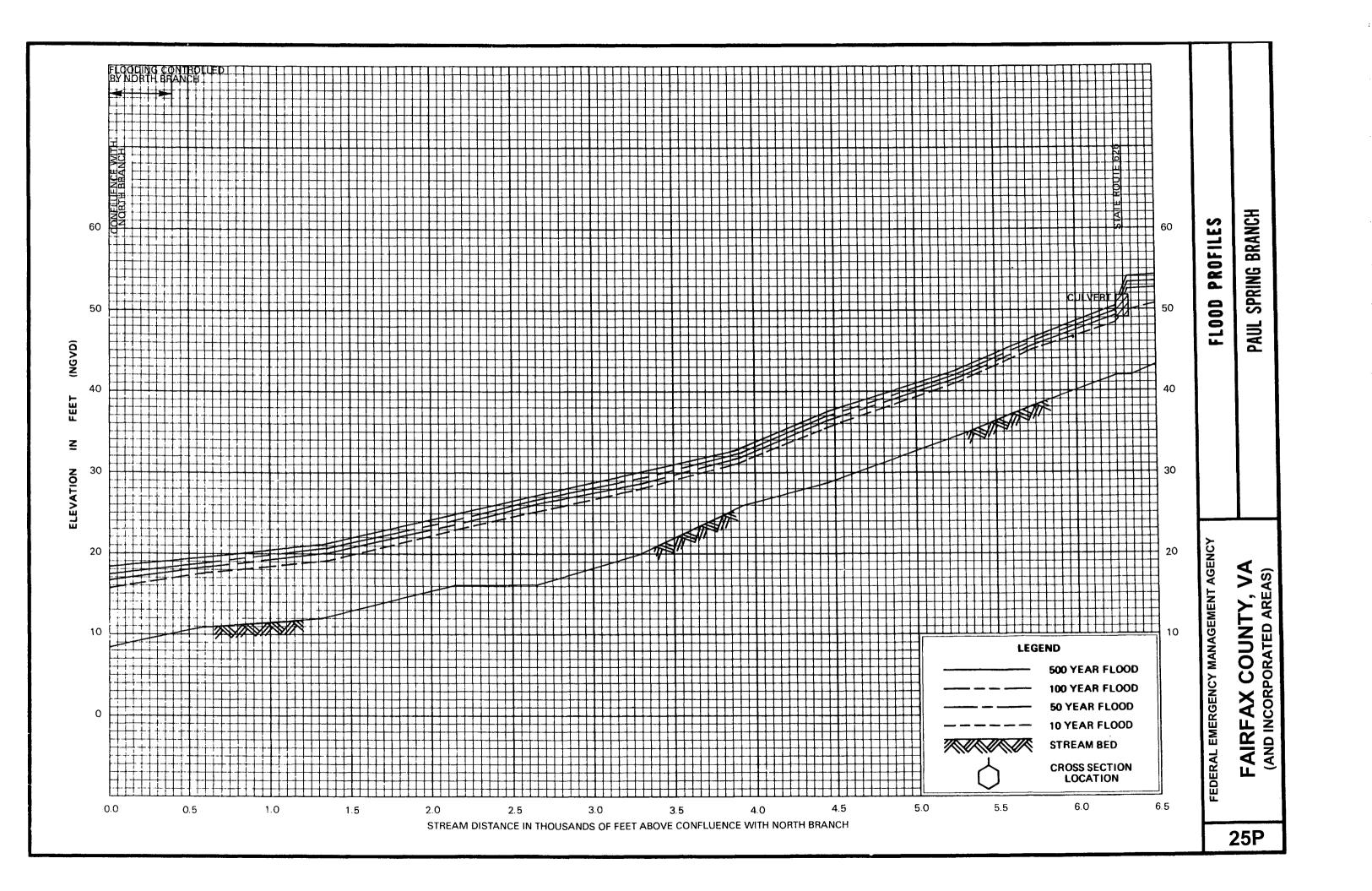


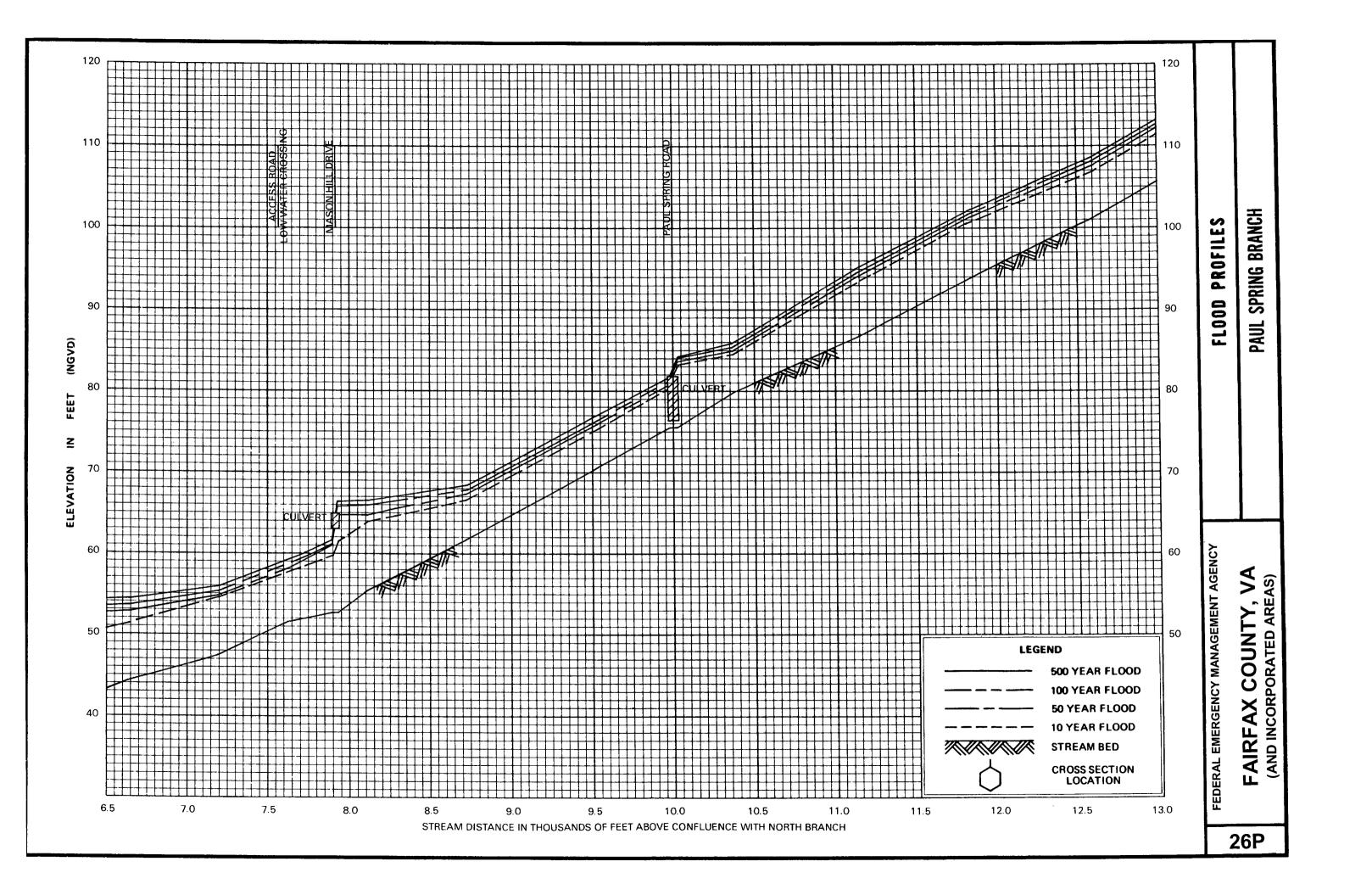


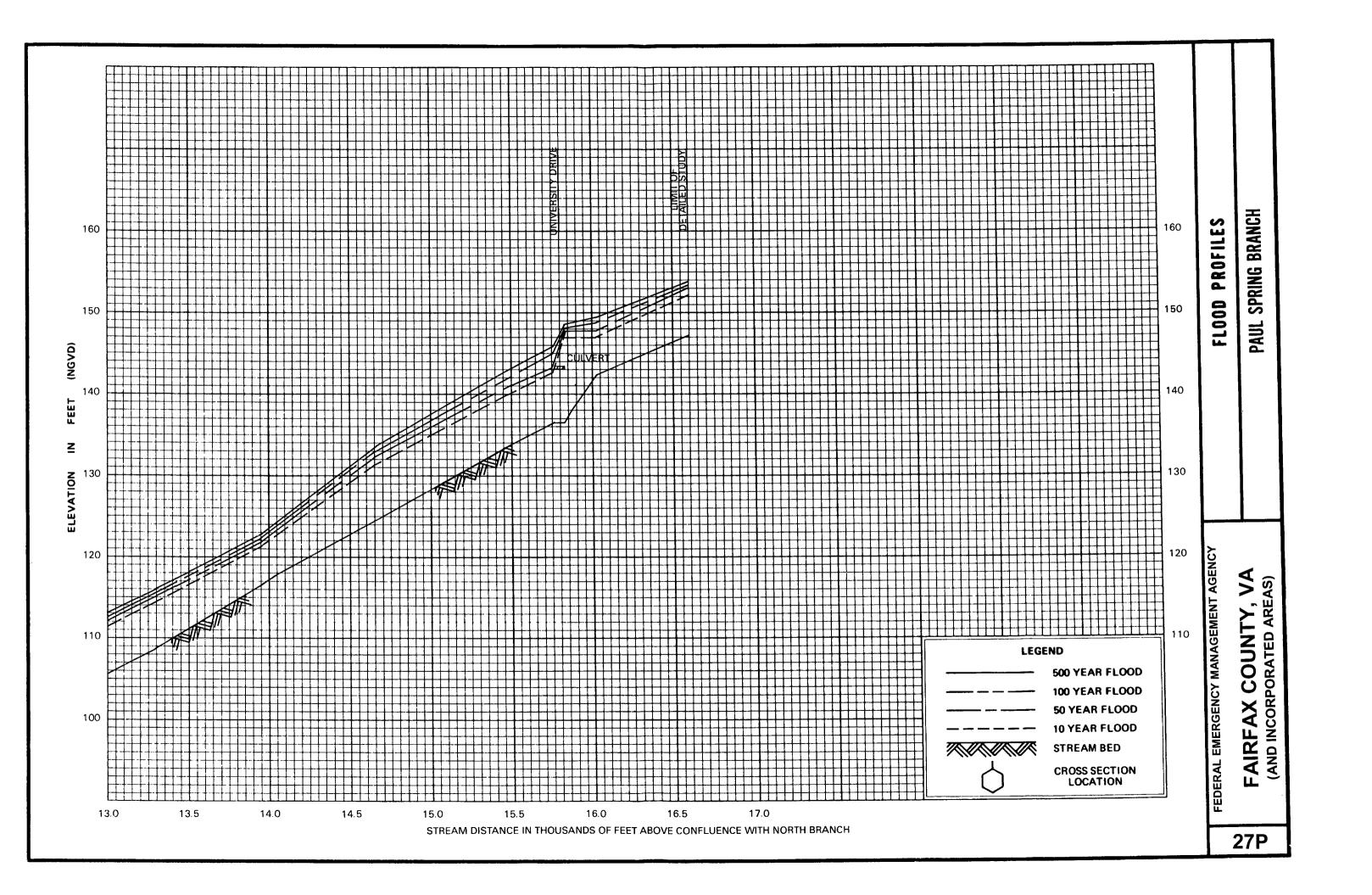


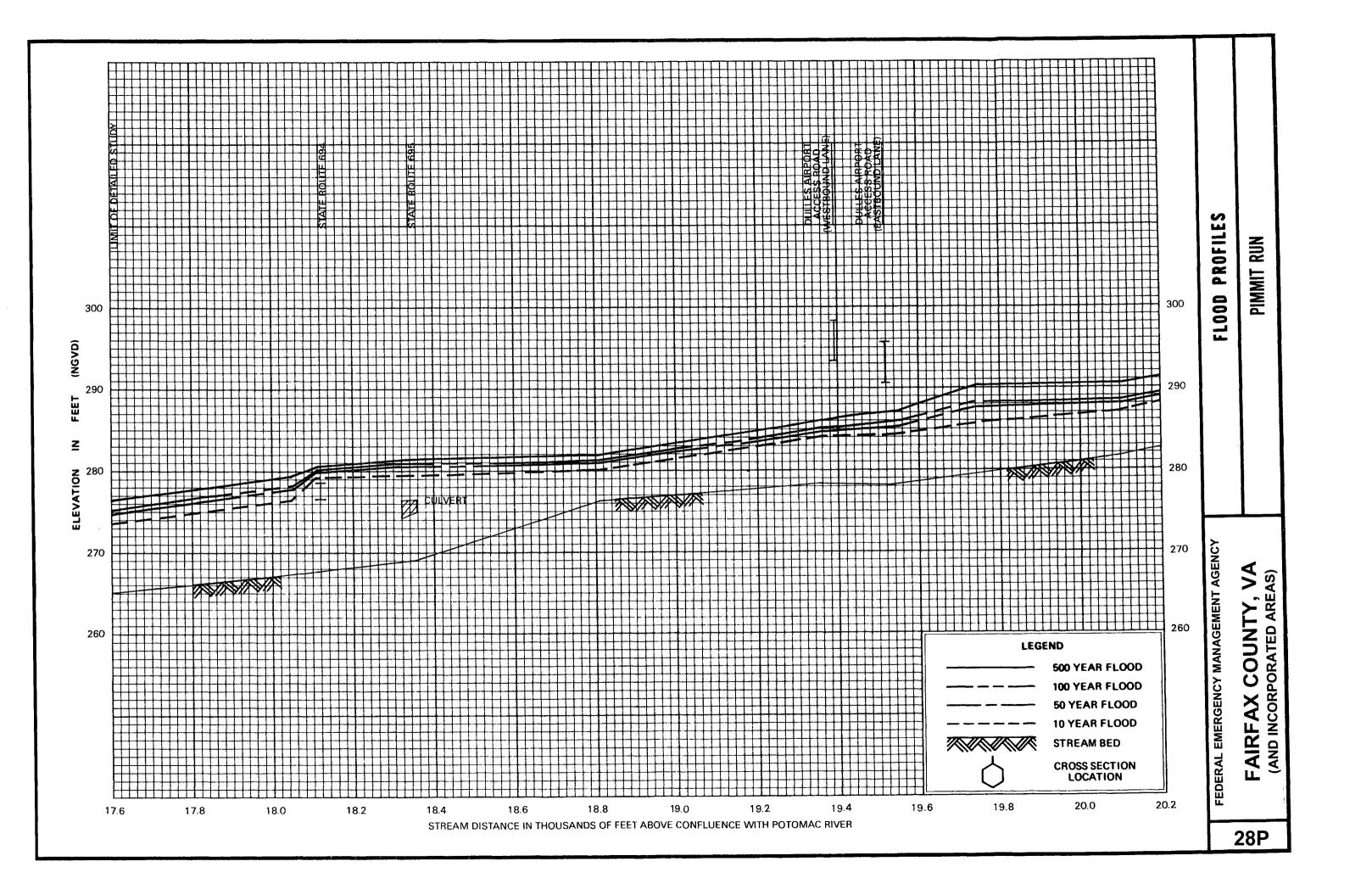


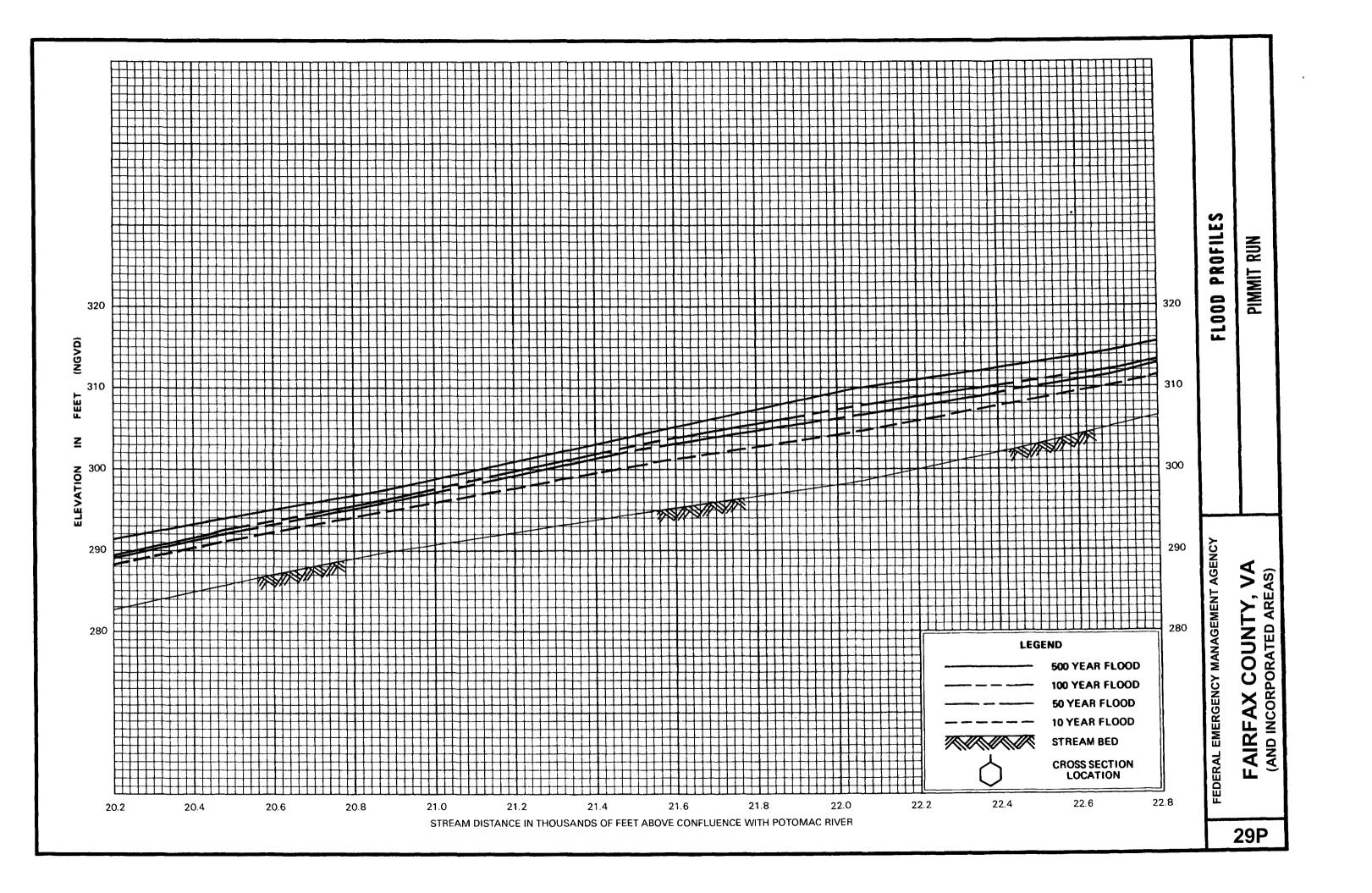


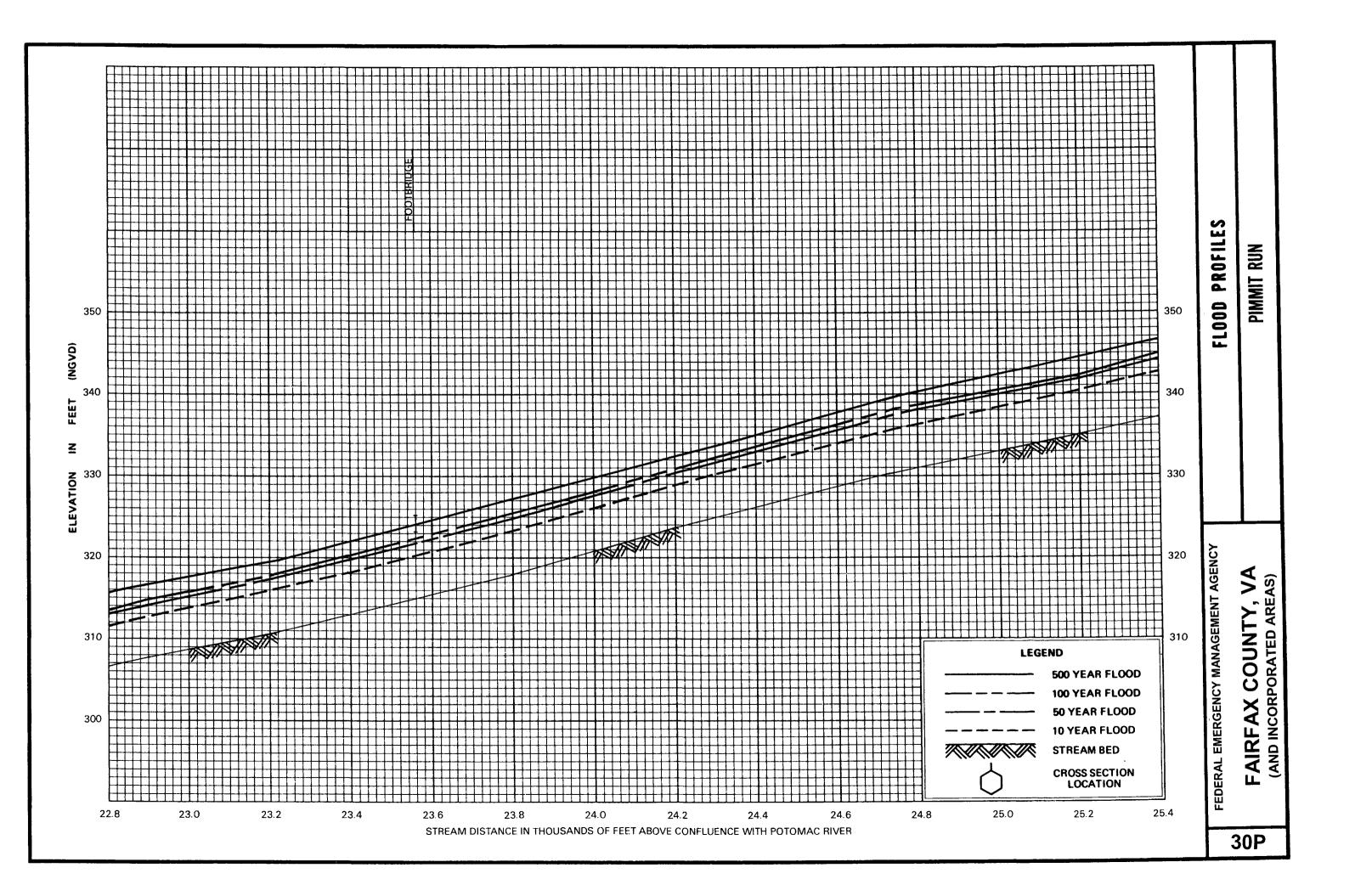


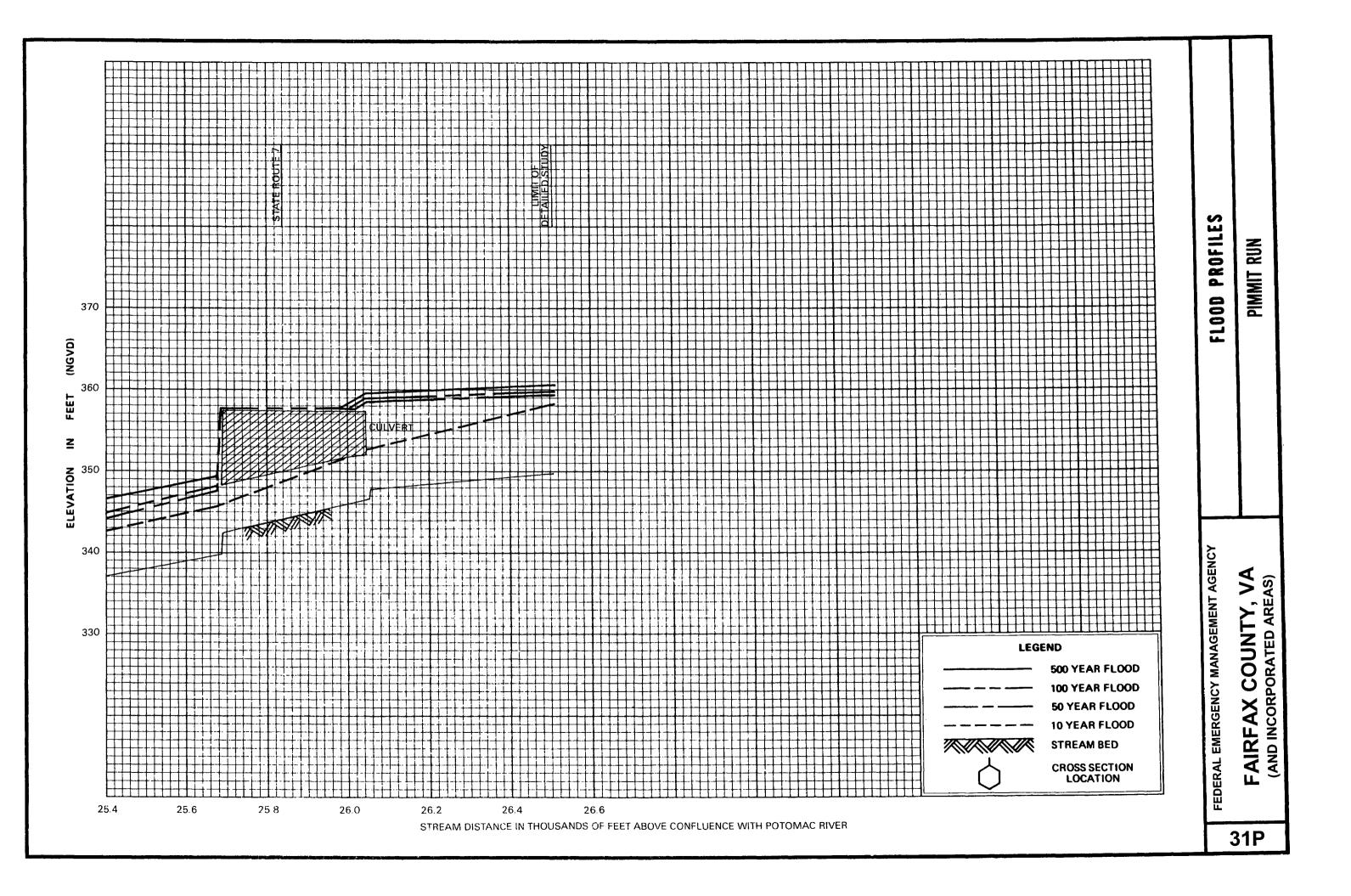


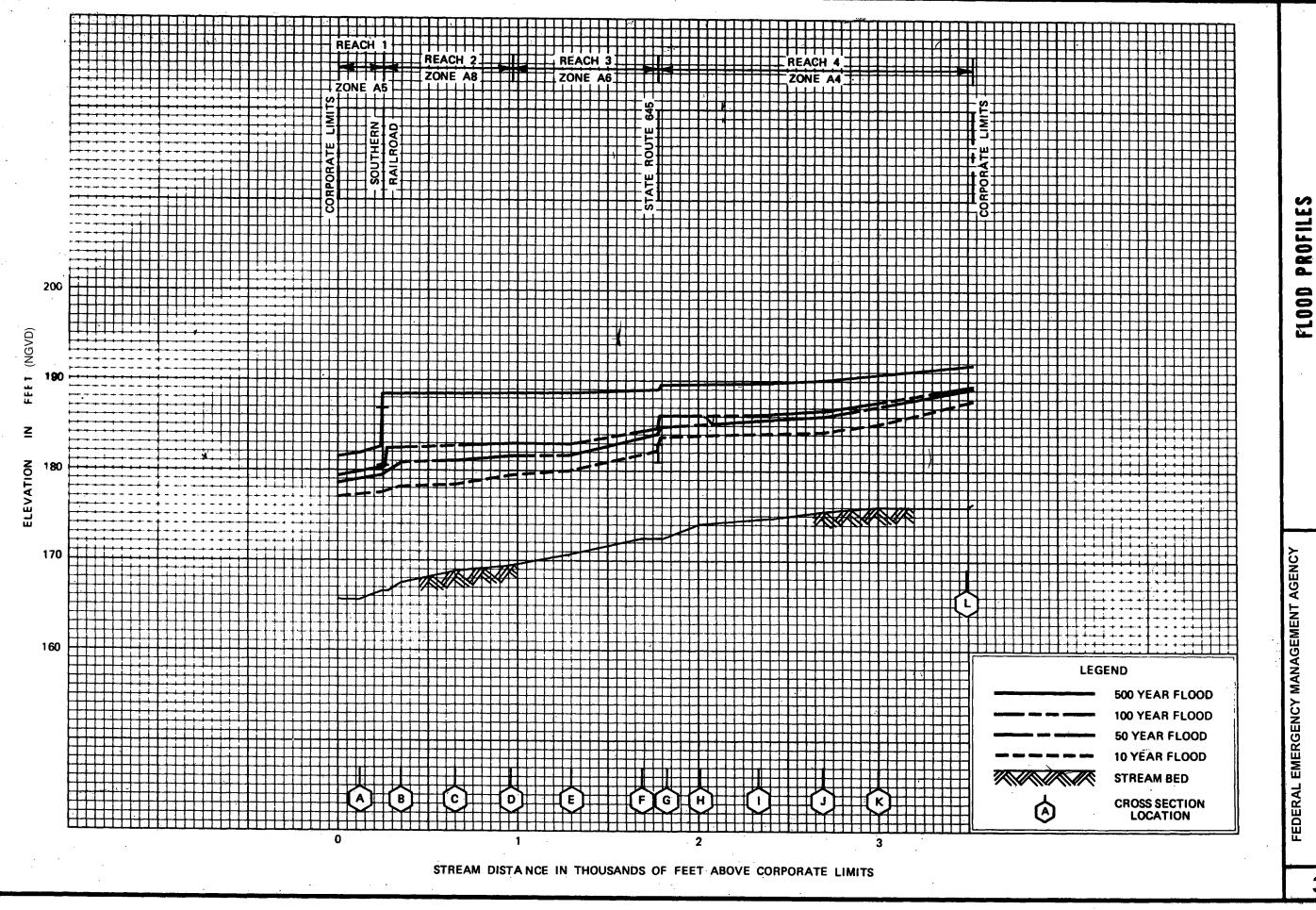










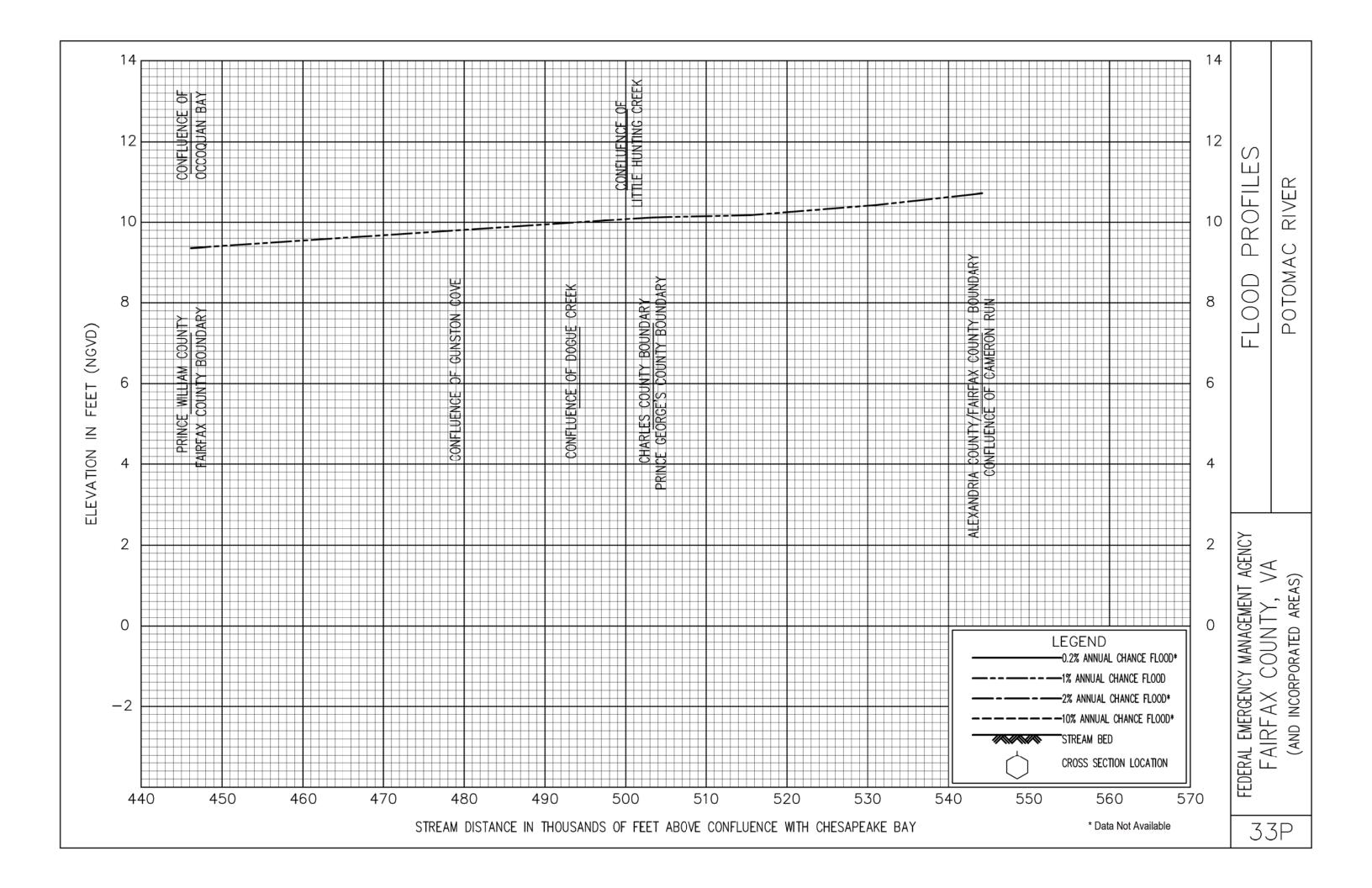


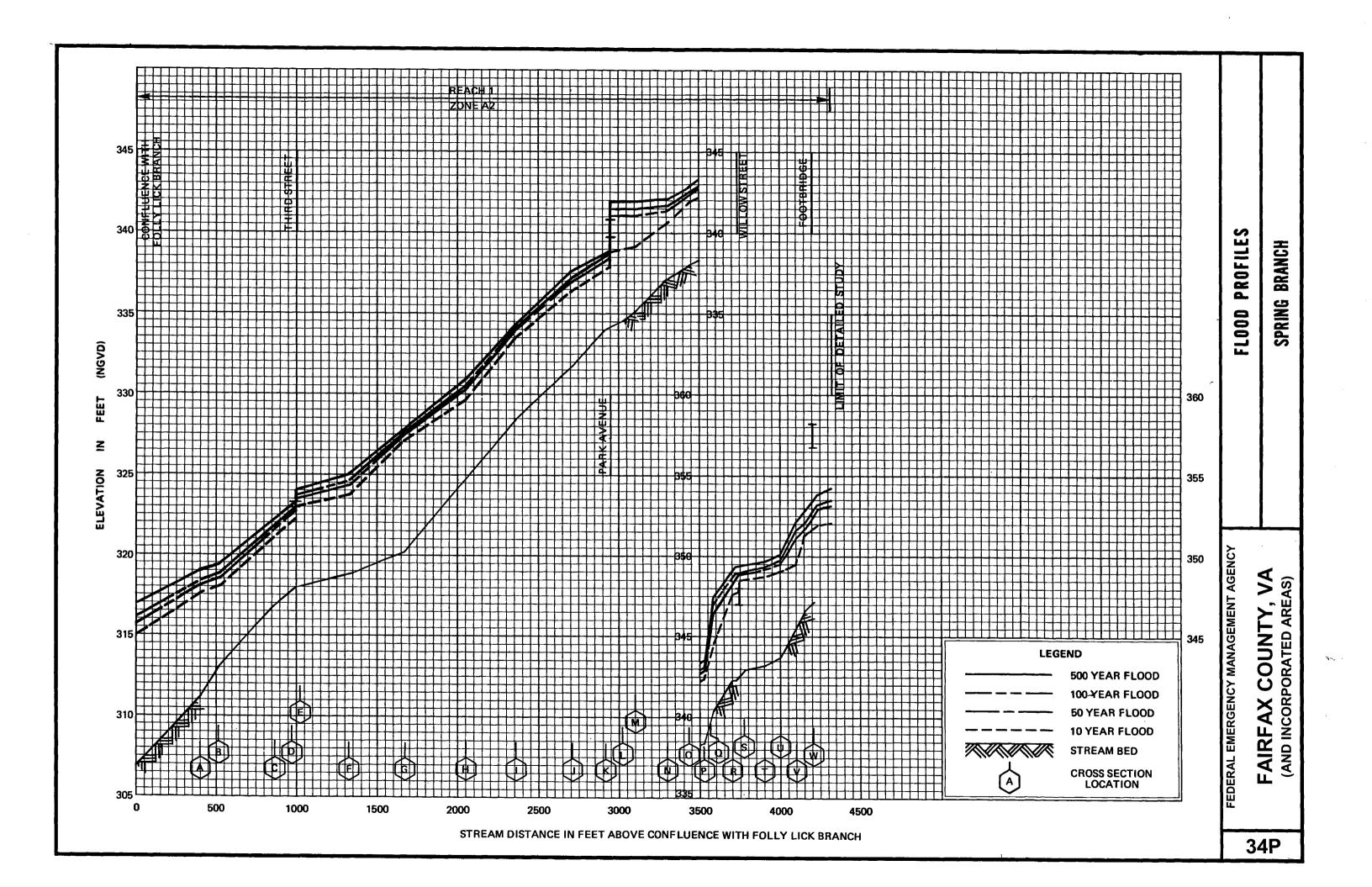
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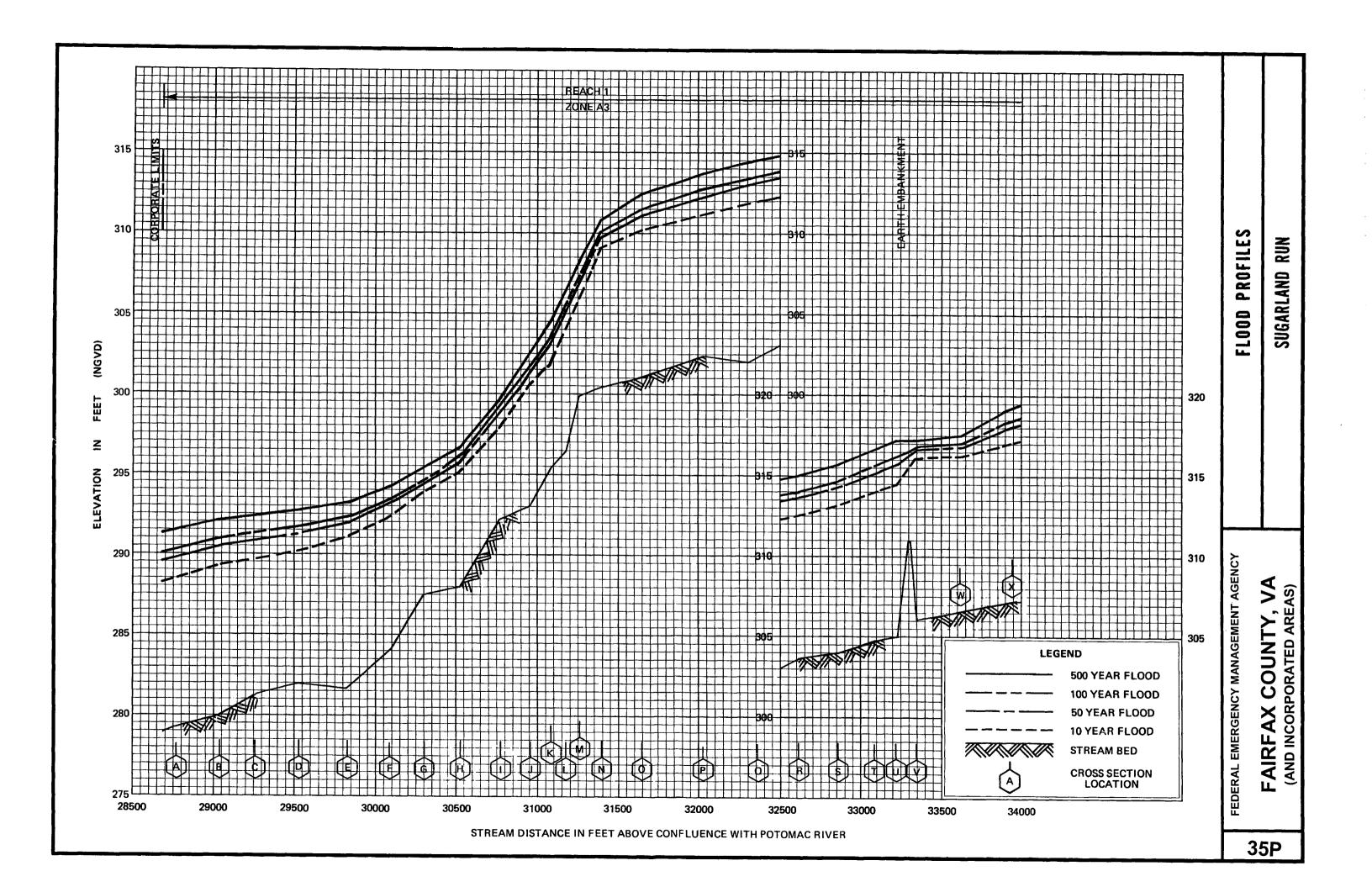
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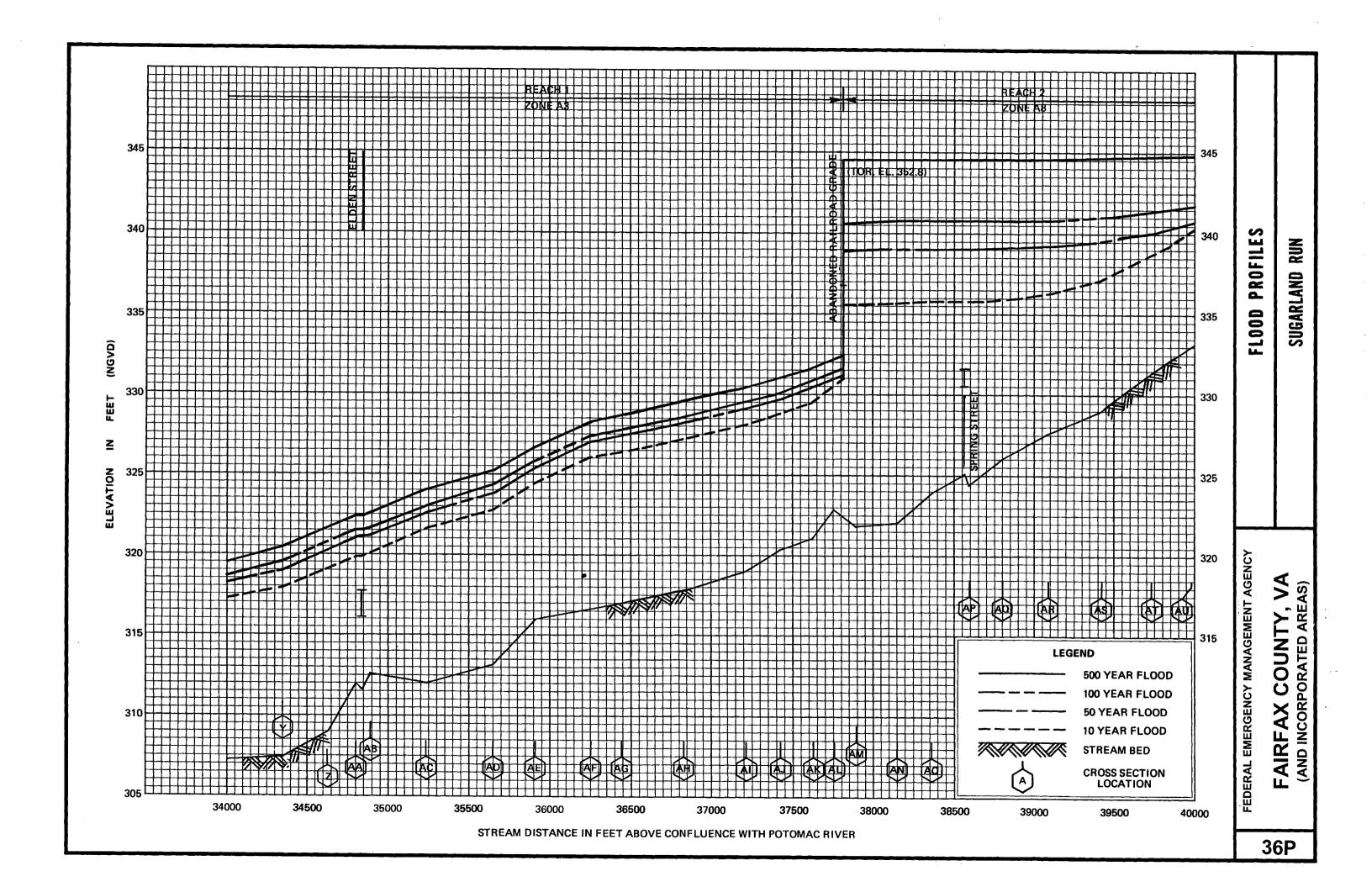
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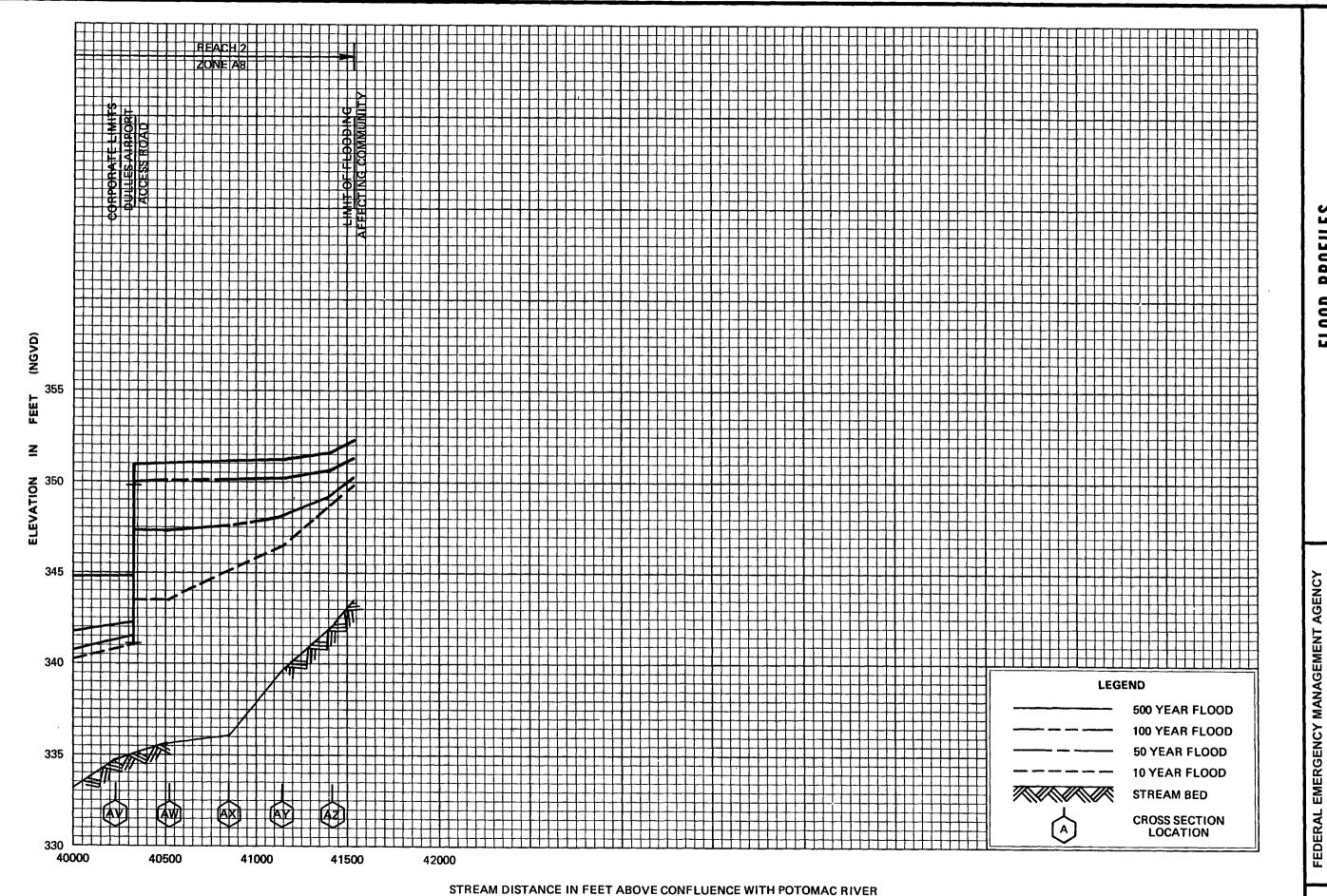
32P









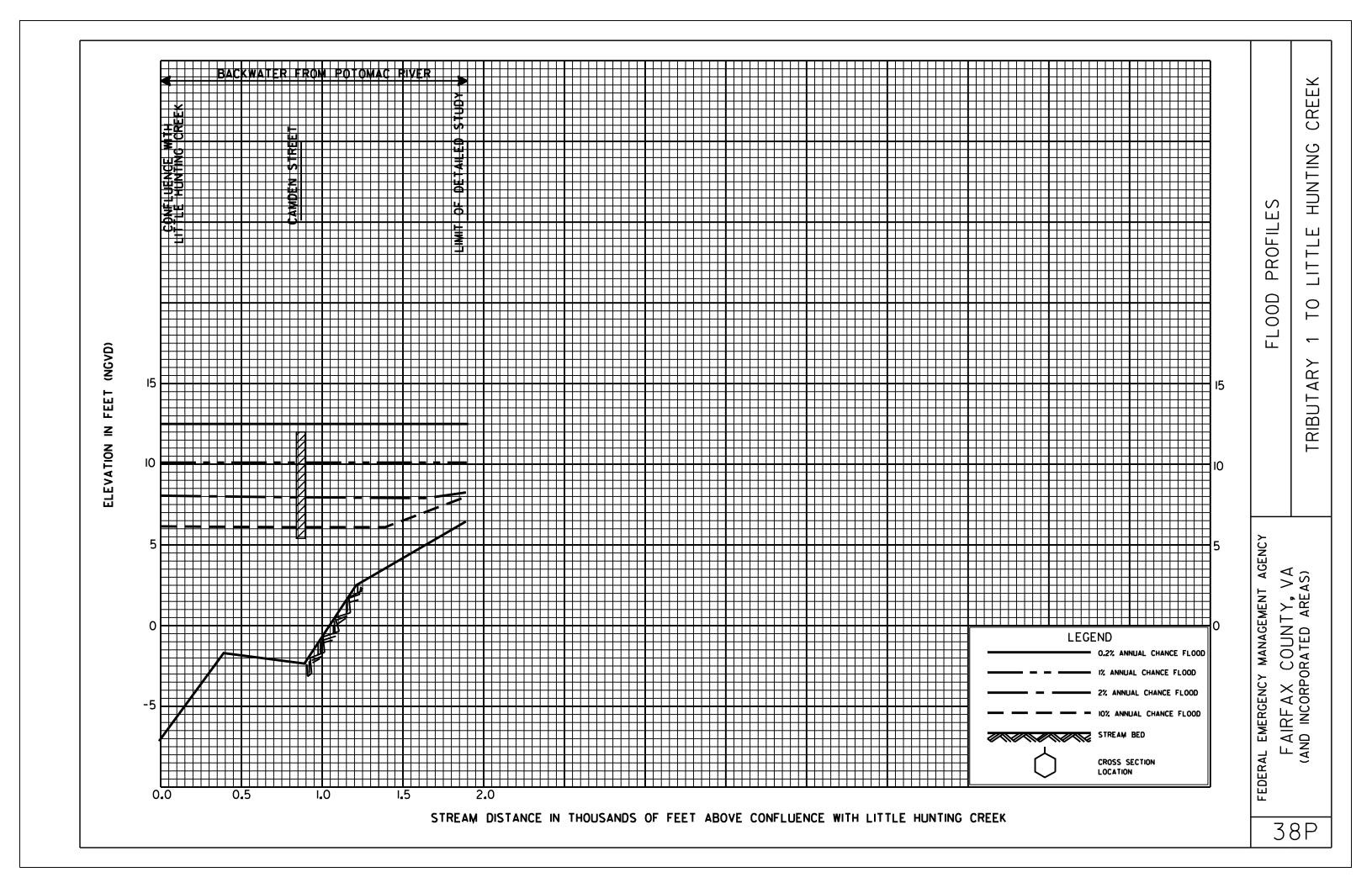


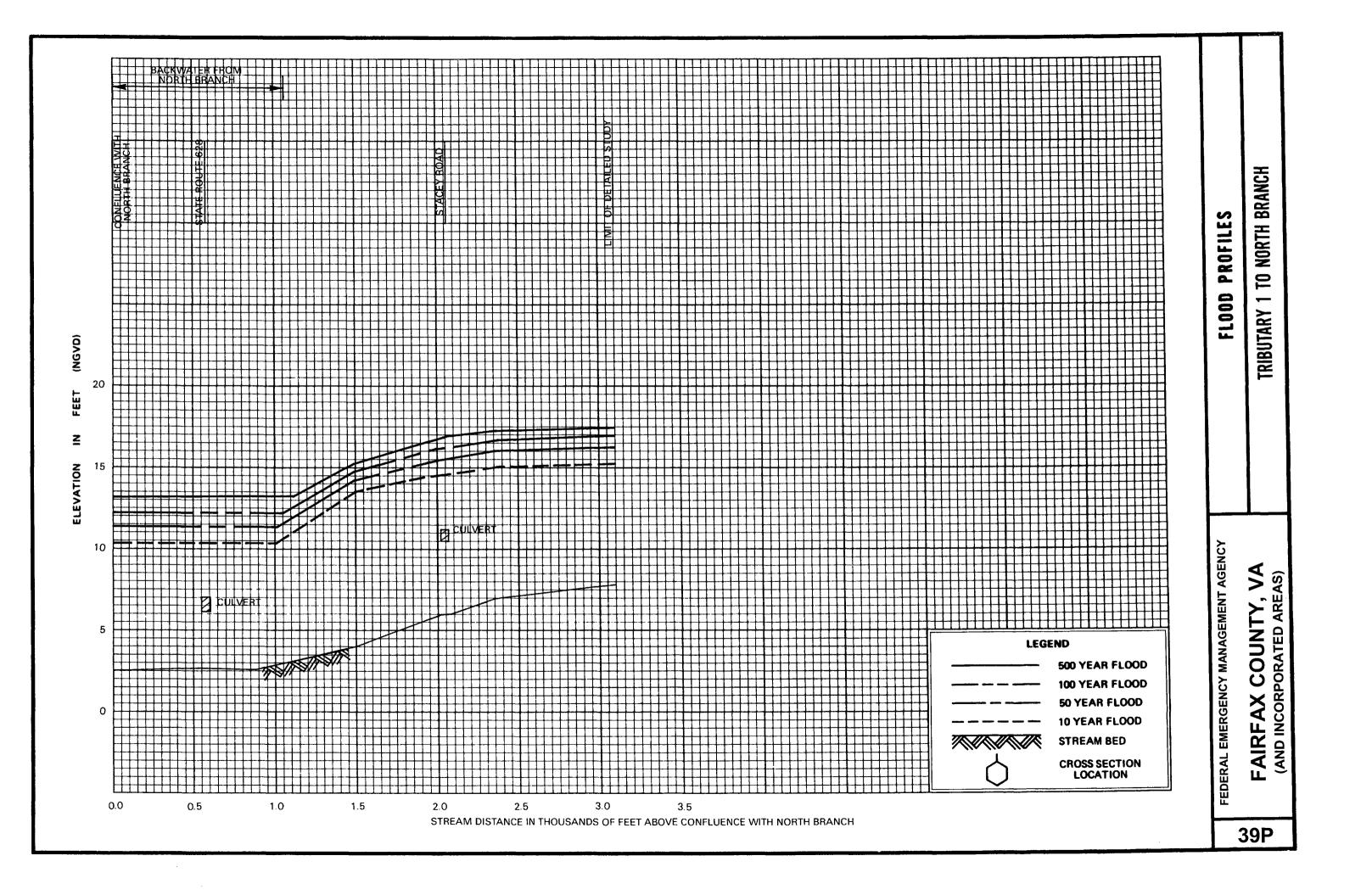
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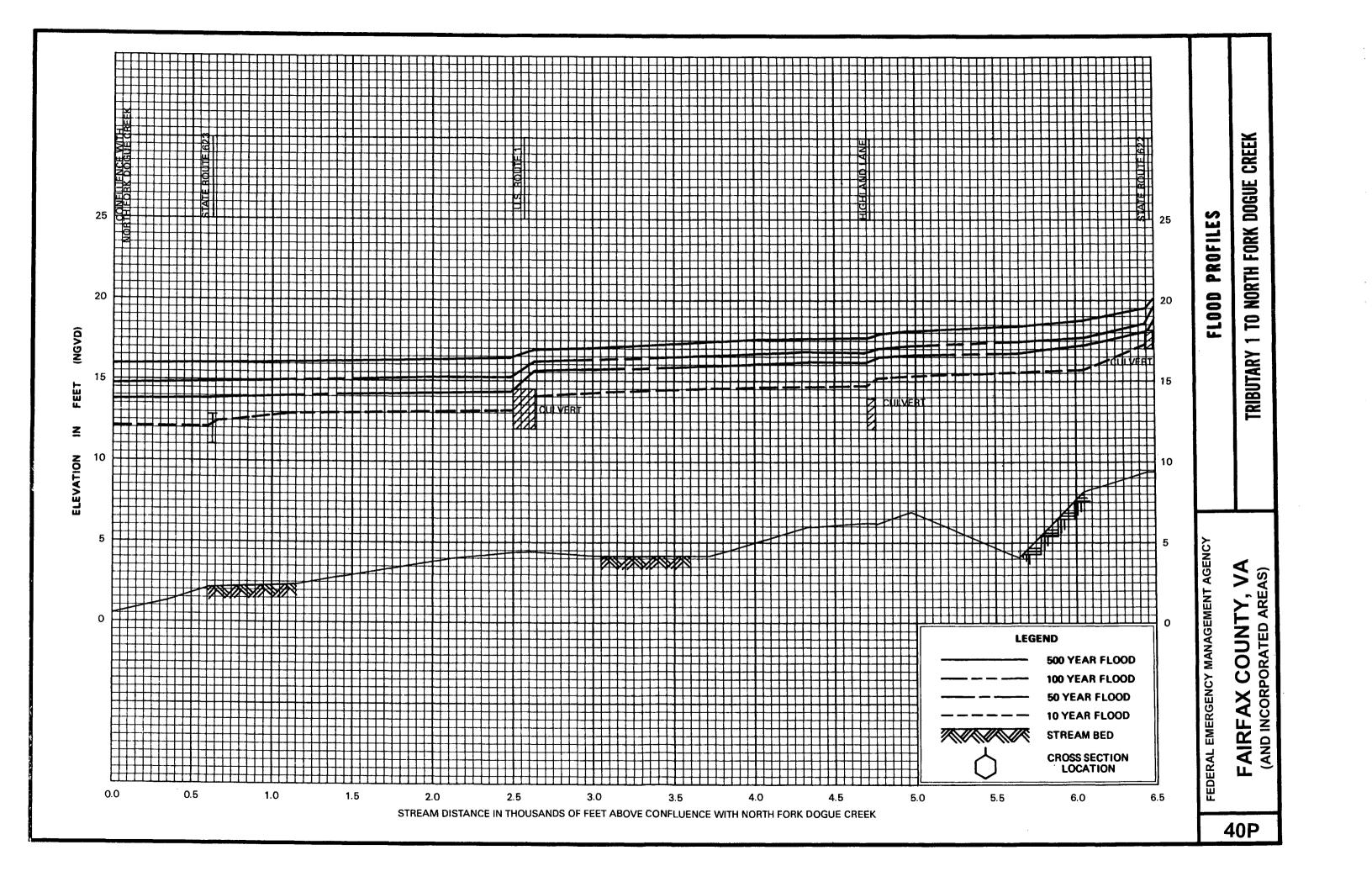
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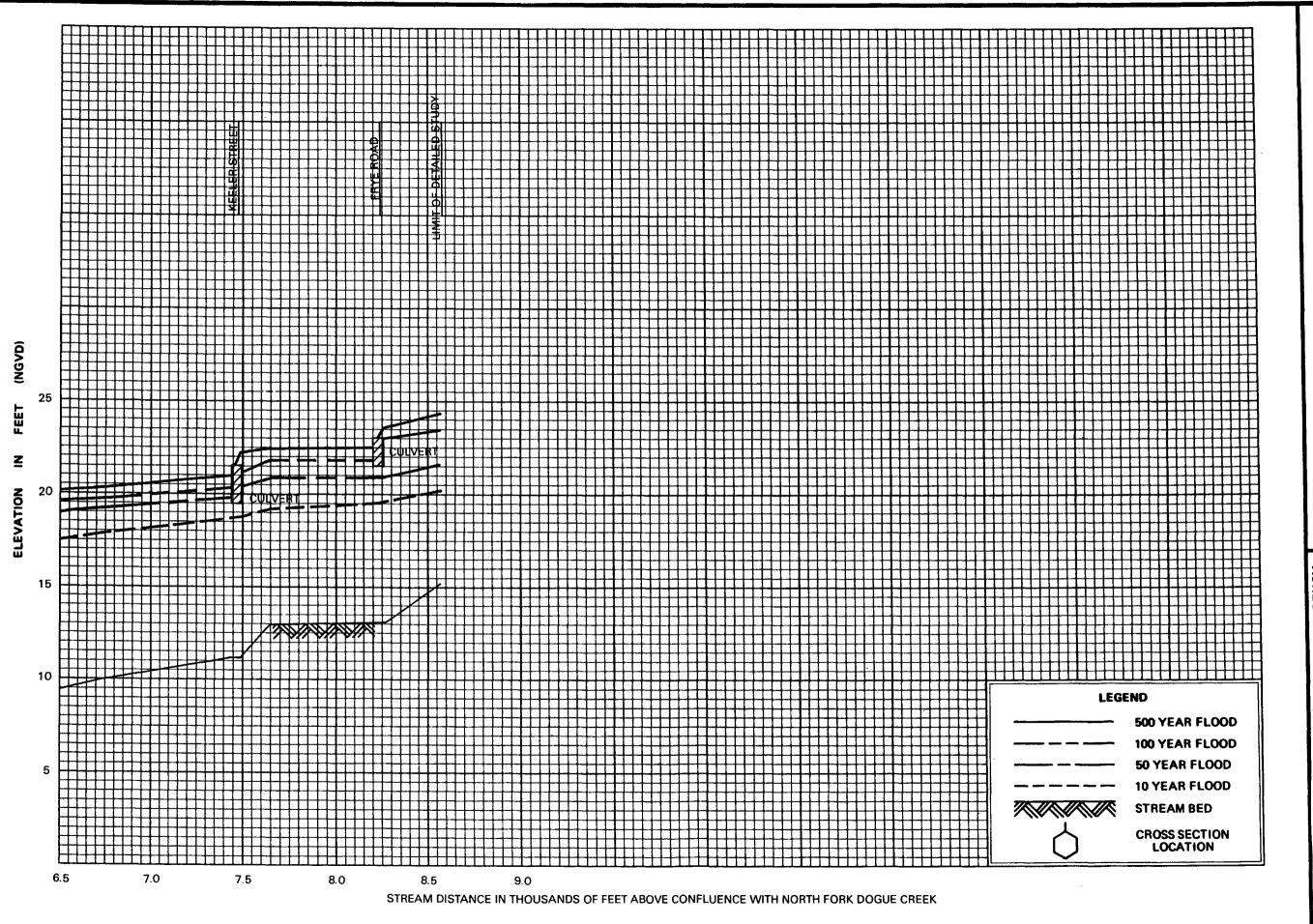
FAIRFAX COUNTY, VA (AND INCORPORATED AREAS)

37P









FLOOD PROFILES

TRIBUTARY 1 TO NORTH FORK DOGUE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

FAIRFAX COUNTY, VA

(AND INCORPORATED AREAS)

41P

